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TOWARDS THE

FORMATION OF A MORE COMPREHENSIVE

THEORY OF LIFE.

BY

S. T. COLERIDGE.

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EDITED BY

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OF ST. JOHN'S COLLEGE,

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"Magna sunt opera DOMINI exquisita in omnes voluntates ejus."

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16, *Norfolk Street, Park Lane.*

PREFACE.

THE accompanying pages contain the unfinished Sketch of a Theory of Life by S. T. Coleridge. Everything that fell from the pen of that extraordinary man bore latent, as well as more obvious indications of genius, and of its inseparable concomitant—originality. To this general remark the present Essay is far from forming an exception. No one can peruse it, without admiring the author's comprehensive research and profound meditation; but at the same time, partly from the exuberance of his imagination, and partly from an apparent want of method (though, in truth, he had a method of his own, by which he marshalled his thoughts in an order perfectly intelligible to himself), a first perusal will, to many readers, prove unsatisfactory, unless they are prepared for it by an introduction of a more popular character. This purpose, therefore, I shall endeavour to accomplish; it being to be understood that I by no means make myself responsible either for Mr. Coleridge's speculations, or for the manner in which they are enunciated; and that, on the contrary, I shall occasionally indicate views from which I dissent, and expressions which perhaps the

author himself, on revision, would have seen reason to correct.

It is clear that Mr. Coleridge considers the unity of human nature to result from two combined elements, Body and Soul; that he regards the latter as the principle of Reason and of Conscience (both which he has largely treated in his published works), and that the "Life," which he here investigates, concerns, in relation to mankind, only the Body. He is far, however, from confining the term "Life" to its action on the human body; on the contrary, he disclaims the division of all that surrounds us into things with life, and things without life; and contends, that the term Life is no less applicable to the irreducible *bases* of chemistry, such as sodium, potassium, &c., or to the various forms of crystals, or the geological strata which compose the crust of our globe, than it is to the human body itself, the acme and perfection of animal organization. I admit that there are certain great powers, such as magnetism, electricity, and chemistry, whose action may be traced, even by the limited means which science at present possesses, in admirable gradation, from purely unorganized to the most highly organized matter: and, I think, that Mr. Coleridge has done this with great ingenuity and striking effect; but what I object to is, that he applies to the combined operation of these powers, in all cases, the term *Life*. If we look back to the early history of language, we shall probably find that this word, and its synonymes in

other tongues, were first employed to denote *human* life, that is, the duration of a human being's existence from birth to the grave. As this existence was marked by actions, many of which were common to man with other animals, those animals also were said to "live;" but the extension of the notion of Life to the vegetable creation is comparatively a recent usage,—and hitherto (in this country at least) no writer before Mr. Coleridge, so far as I know, has maintained that rocks and mountains, nay, "the great globe itself," share with mankind the gift of Life. On the other hand, there are well known and energetic uses of the word "Life," to which Mr. Coleridge's speculations, as contained in the accompanying pages, are wholly inapplicable. Almost all nations, even the most savage, agree in the belief that individuals of the human race, after they have ceased to exist in this mortal life, will exist in another state, to which also the word Life is universally applied; but to this latter Mr. Coleridge's views of magnetism, electricity, &c., can hardly be thought applicable. Still less can they apply to "Life" in its spiritual sense; as, when Moses says to the Jews, "the words of the law are your *life*," (Deut. xxxii, 47,) and when our Saviour says, "the words that I speak unto you, they are spirit, and they are *life*;" (John, vi, 63;) and again, "I am the resurrection and the *life*," (John, xi, 25.) Upon the whole, therefore, I think it would have been advisable in Mr. Coleridge to have adopted a different phraseology, in tracing the opera-

tion of certain natural agencies first on unorganized, and then on organized bodies.

Another word, of which I consider an improper use to be made in this Essay, is "Nature." I find this imaginary being introduced on all occasions, and invested with attributes of personality, which may be extremely apt to make a false impression on young or thoughtless minds. At one time, "the life of Nature" is spoken of; then we are informed that "Nature has succeeded. *She* has created the intermediate link between the vegetable world and the animal." Again, it is said that "Nature seems to fall back, and to reexert *herself* on the lower ground, which *she* had before occupied;"—and elsewhere we are told that "Nature never loses what *she* has once learnt; though in the acquirement of each new power *she* intermits or performs less energetically the act immediately preceding. *She* often drops a faculty, but never fails to pick it up again. *She* may seem forgetful and absent; but it is only to recollect *herself* with additional as well as recruited vigour in some after and higher state." Now the word "Nature," in any intelligible sense, means nothing but that method and order by which the Almighty regulates the common course of things. Nature is not a person; it is not active; it neither creates nor performs actions more or less energetically, nor learns, nor forgets, nor reexerts itself, nor recruits its vigour. Perhaps it will be said that all this is merely figurative language. Figurative language is

very much misplaced in strict philosophical investigations; and these particular figures, which might be quite consistent with the atheistical philosophy of Lucretius, sound ill in the mouth of a pious Christian, which Mr. Coleridge undoubtedly was. He probably adopted them unconsciously from Bacon; but Bacon's use of the word Nature ought rather to have served as a warning than an example; for it has contributed, in no small degree, to the atheistical philosophy of recent times.

The prevalent natural philosophy of the present day is that which is called *corpuscular*, because it assumes the existence of a first matter, consisting of *corpuscula* or atoms, which are supposed to be definite, though extremely small, *quantities*, invested with the *qualities* of extension, impenetrability, and the like; and from certain combinations of these qualities, Life is considered, by some persons, to be a necessary result. This philosophy Mr. Coleridge combats. The supposed atoms, he says, are mere abstractions of the mind; and Life is not a thing, the result of atomic arrangement or action, but is itself an act, or process. He refutes various definitions of Life, such as, that it is the sum of all the functions by which death is resisted; or, that it depends on the faculty of nutrition, or of antiputrescence. His own definition he proposes merely as an hypothesis. Life, he says, is "the principle of Individuation," that is to say, it is a power which

discloses itself from within, combining many qualities into one individual thing. This individualising principle unites, as he conceives, with the cooperating action of magnetism, electricity, and chemistry. At least, such is the inference to be drawn from the present state of science; though it is easily conceivable that future discoveries may bring us acquainted with powers more directly connected with Life. The most general law governing the action of Life, as a tendency to individuation, is here designated *polarity;* for instance, the power termed magnetism (not meaning that there is necessarily an actual tangible magnet in the case) has two poles, the negative, answering to attraction, rest, carbon, &c., and the positive, answering to repulsion, mobility, azote, &c.; and as the magnetic needle which points to the north necessarily indicates thereby the south, so the power disposing to rest has necessarily a counteracting influence disposing to mobility, between which lies the point of indifference. Now this quality, to which Mr. Coleridge gives the name of polarity, is in truth nothing more than an exemplification of the doctrine of opposites, the πρός ἄλληλα ἀντικειμένων ἀντίθεσις, which the Eleatic Philosopher, in Plato's 'Sophist,' applies to the idea of existence and non-existence, and which accompanies every other idea as its shadow, whether in physics, in intellect, or in morals; for the finite is opposed to the infinite, the false to the true, the evil to the

good, and so forth; which we say, not to derogate from the value of Mr. Coleridge's application of the doctrine, of which he has very ably availed himself; but merely to explain the term polarity, by referring it, as a species, to a higher genus of intellectual conceptions.

Reverting to the three powers before mentioned, it is not to be understood, that on Mr. Coleridge's hypothesis of Life, they ever act separately; but in the different modifications of Life, at one time the power of magnetism predominates, at another that of electricity, and at another that of chemistry. Magnetism is stated to act as a line, electricity as a surface, and chemistry as a solid; for all which Mr. Coleridge refers to certain physical experiments. The predominance of magnetism is characterised by reproduction, that of electricity by irritability; and irritability, which first appears as muscle, gradually rises into sensibility as nerve. The limits of a mere introduction will not permit me to examine Mr. Coleridge's first principles more in detail; and I can but briefly notice their application to the successive stages of ascent, from the first rudiments of individualised Life, in the lowest classes of the mineral, vegetable, and animal creation, to its crown and consummation in the human body. Beginning with magnetism, by which, in its widest sense, he means what he improperly calls the first and simplest differential act of *Nature* (he should rather have said the first and simplest conception that we can form of a differential

act of God, in the work of creation), he supposes the pre-existence of chaos, not, indeed, in the Miltonic sense—

> "For hot, cold, moist, and dry, four champions fierce,
> Strive *there* for mast'ry, and to battle bring
> Their embryon atoms,—"

but rather as one vast homogeneous fluid, and even *that* he suggests not as a historical fact, but as the appropriate symbol of a great fundamental truth. The first effort of magnetic power, the first step from indifference to difference, from formless homogeneity to independent existence, is seen in the tranquil deposition of crystals; and an increasing tendency to difference is observable in the increasing multitude of strata, till we come to organic life; of which the vegetable and animal worlds may be regarded as opposite poles; carbon prevailing in the former and azote in the latter; and vegetation being characterised by the predominance of magnetism in its highest power, as reproduction; whilst the animal tribes evince the power of electricity, as shown in irritability and sensibility. Passing over the forms of vegetation, we come to the polypi, corallines, &c., in which individuality appears in its first dawn; for a multitude of animals form, as it were, a common animal, and different genera pass into each other, almost indistinguishably. The tubipora of the corals connects with the serpula of the conchylia. In the *mollusca* the separation of organs becomes more observable; in the higher species there are rudiments

of nerves, and an exponent, though scarcely distinguishable, of sensibility. In the snail, and muscle, the separation of the fluid from the solid is more marked, yet the prevalence of the carbonic principle connects these and the preceding classes, in a certain degree, with the vegetable creation. "But the *insect* world, taken at large (says Mr. Coleridge) appears as an intense *Life*, that has struggled itself loose, and become emancipated from vegetation — *Floræ liberti, et libertini!*" In insects we first find the distinct commencement of a separation between the muscular system, that is, organs of irritability, and the nervous system, that is, organs of sensibility; the former, however, maintaining a pre-eminence throughout, and the nerves themselves being probably subservient to the motory power. With the fishes begins an internal system of bones, but these are the results of a comparatively imperfect formation, being in general little more than mere gristle. In birds we find a sort of synthesis of the powers of fish and insects. In all three, the powers are under the predominance of irritability; but sensibility, which is dormant in the insect, begins to awaken in the fish, and, though still subordinate, is quite awake in the bird, of which no better proof can be given than its power of sound, with the rudiments of modulation, in the large class of singing birds, and in some others a tendency to acquire and to imitate articulate speech. The next step of ascent brings us to the *mammalia;* and in these, including beasts and men, the complete and universal presence of

a nervous system raises sensibility to its due place and rank among the animal powers. Finally, in Man the whole force of organic power attains an inward and centripetal direction, and the "apex of the living pyramid" becomes a fit receptacle for Reason and Conscience.

It is much to be regretted, that the estimable Author did not live to put a finishing hand to this Essay; but the part completed involves speculations of so interesting a nature, and presents such striking marks of deep and original thought, that the Editor, to whose hands it was committed, did not feel himself justified in withholding it from the judgment of the public.

THE THEORY OF LIFE.

PHYSIOLOGY OF LIFE.

INTRODUCTION.

When we stand before the bust of John Hunter, or as we enter the magnificent museum furnished by his labours, and pass slowly, with meditative observation, through this august temple, which the genius of one great man has raised and dedicated to the wisdom and uniform working of the Creator, we perceive at every step the guidance, we had almost said, the inspiration, of those profound ideas concerning Life, which dawn upon us, indeed, through his written works, but which he has here presented to us in a more perfect language than that of words—the language of God himself, as uttered by Nature.

That the true idea of Life existed in the mind of John Hunter I do not entertain the least doubt; but it may, perhaps, be doubted whether his incessant occupation, and his stupendous industry in the service, both of his contem-

poraries and of posterity, added to his comparatively slight acquaintance with the arts and aids of logical arrangement, permitted him fully to unfold and arrange it in distinct, clear, and communicable conceptions. Assuredly, however, I may, without incurring the charge of arrogance or detraction, venture to assert that, in his writings the light which occasionally flashes upon us seems at other times, and more frequently, to struggle through an unfriendly medium, and even sometimes to suffer a temporary occultation. At least, in order to dissipate the undeniable obscurities, and to reconcile the apparent contradictions found in his works,—to distinguish, in short, the numerous passages in which without, perhaps, losing sight internally of his own peculiar belief, he yet falls into the phrascology and mechanical solutions of his age,—we must distinguish such passages from those in which the form corresponds to the substance, and in which, therefore, the nature and essential laws of vital action are expressed, as far as his researches had unveiled them to his own mind, without disguise. To effect this, we must, as it were, climb up on his shoulders, and look at the same objects in a distincter form, because seen from the more commanding point of view furnished by himself. This has, indeed, been more than once attempted already, and, in one instance, with so evident a display of power and insight as announces in the assertor and vindicator of the Hunterian Theory a congenial intellect, and a disciple in

whom Hunter himself would have exulted. Would that this attempt had been made on a larger scale, that the writer to whom I refer[1] had in consequence developed his opinions systematically, and carried them yet further back, even to their ultimate principle!

But this the scientific world has yet to expect; or it is more than probable that the present humble endeavour would have been superseded, or confined, at least, to the task of restating the opinion of my predecessor with such modifications as the differences that will always exist between men who have thought independently, and each for himself, have never failed to introduce, even on problems of far easier and more obvious solution.

Without further preface or apology, therefore, I shall state at once my objections to all the definitions that have hitherto been given of Life, as meaning too much or too little, with an exception, however, in favour of those which mean nothing at all; and even these last must, in certain cases, receive an honour they do not merit, and be confuted, or rather detected, on account of their too general acceptance, and the incalculable power of words over the minds of men in proportion to the remoteness of the subject from the cognizance of the senses.

[1] Mr. Abernethy.

It would be equally presumptuous and unreasonable should I, with a late writer on this subject, "exhort the reader to be particularly on his guard against loose and indefinite expressions;" but I perfectly agree with him that they are the bane of all science, and have been remarkably injurious in the different departments of physiology.

THE NATURE OF LIFE.

ON THE DEFINITIONS OF LIFE HITHERTO RECEIVED. HINTS TOWARDS A MORE COMPREHENSIVE THEORY.

THE attempts to explain the nature of Life, which have fallen within my knowledge, presuppose the arbitrary division of all that surrounds us into things with life, and things without life—a division grounded on a mere assumption. At the best, it can be regarded only as a hasty deduction from the first superficial notices of the objects that surround us, sufficient, perhaps, for the purpose of ordinary discrimination, but far too indeterminate and diffluent to be taken unexamined by the philosophic inquirer. The positions of science must be tried in the jeweller's scales, not like the mixed commodities of the market, on the weigh-bridge of common opinion and vulgar usage. Such, however, has been the procedure in the present instance, and the result has been answerable to the coarseness of the process. By a comprisal of the *petitio principii* with the *argumentum in circulo*,—in plain English, by an easy logic, which begins with begging the question, and then moving in a circle, comes round to the point where it began,—each of the two divisions has been made to define the other by a mere reassertion of their assumed contrariety. The physiologist has luminously explained Y plus X by informing us that it is a somewhat that is the antithesis of Y minus X; and if we ask, what

then is Y—X? the answer is, the antithesis of Y+X,—a reciprocation of great service, that may remind us of the twin sisters in the fable of the Lamiæ, with but one eye between them both, which each borrowed from the other as either happened to want it; but with this additional disadvantage, that in the present case it is after all but an eye of glass. The definitions themselves will best illustrate our meaning. I will begin with that given by Bichat. "Life is the sum of all the functions by which death is resisted," in which I have in vain endeavoured to discover any other meaning than that life consists in being able to live. This author, with a whimsical gravity, prefaces his definition with the remark, that the nature of life has hitherto been sought for in *abstract* considerations; as if it were possible that four more inveterate abstractions could be brought together in one sentence than are here assembled in the words, life, death, function, and resistance. Similar instances might be cited from Richerand and others. The word Life is translated into other more learned words; and this *paraphrase* of the *term* is substituted for the *definition* of the *thing*, and therefore (as is always the case in every *real* definition as contra-distinguished from a *verbal* definition,) for at least a partial *solution* of the *fact*. Such as these form the *first* class.—The second class takes some one particular function of Life common to all living objects,—nutrition, for instance; or, to adopt the phrase most in vogue at present, assimilation, for the purposes of reproduction and growth. Now this, it is evident, can be an appropriate definition only of the very lowest species, as of a Fungus or a Mollusca; and just as comprehensive an idea

of the mystery of Life, as a Mollusca might give, can this definition afford. But this is not the only objection. For, *first*, it is not pretended that we begin with seeking for an organ evidently appropriated to nutrition, and then infer that the substance in which such an organ is found *lives*. On the contrary, in a number of cases among the obscurer animals and vegetables we infer the organ from the pre-established fact of its life. *Secondly*, it identifies the process itself with a certain range of its forms, those, namely, by which it is manifested in animals and vegetables. For this, too, no less than the former, presupposes the arbitrary division of all things into not living and lifeless, on which, as I before observed, all these definitions are grounded. But it is sorry logic to take the proof of an affirmative in one thing as the proof of the negative in another. All animals that have lungs breathe, but it would be a childish oversight to deduce the converse, viz. all animals that breathe have lungs. The theory in which the French chemists organized the discoveries of Black, Cavendish, Priestly, Scheele, and other English and German philosophers, is still, indeed, the reigning theory, but rather, it should seem, from the absence of a rival sufficiently popular to fill the throne in its stead, than from the continuance of an implicit belief in its own stability. We no longer at least cherish that intensity of faith which, before Davy commenced his brilliant career, had not only identified it with chemistry itself, but had substituted its nomenclature, even in common conversation, for the far more philosophic language which the human race had abstracted from the laboratory of Nature. I may venture to prophecy that no future

Beddoes will make it the corival of the mathematical sciences in demonstrative evidence. I think it a matter of doubt whether, during the period of its supposed infallibility, physiology derived more benefit from the extension, or injury from the misdirection, of its views. Enough of the latter is fresh in recollection to make it but an equivocal compliment to a physiological position, that it must stand or fall with the corpuscular philosophy, as modified by the French theory of chemistry. Yet should it happen (and the event is not impossible, nor the supposition altogether absurd,) that more and more decisive facts should present themselves in confirmation of the metamorphosis of elements, the position that life consists in assimilation would either cease to be distinctive, or fall back into the former class as an identical proposition, namely, that Life, meaning by the word that sort of growth which takes place by means of a peculiar organization, consists in that sort of growth which is peculiar to organized life. *Thirdly*, the definition involves a still more egregrious flaw in the reasoning, namely, that of *cum hoc, ergo propter hoc* (or the assumption of causation from mere coexistence); and this, too, in its very worst form. For it is not *cum hoc solo, ergo propter hoc*, which would in many cases supply a presumptive proof by induction, but *cum hoc, et plurimis aliis, ergo propter hoc!* Shell, of some kind or other, is common to the whole order of testacea, but it would be absurd to define the *vis vitæ* of testaceous animals as existing in the shell, though we know it to be the constant accompaniment, and have every reason to believe the constant effect, of the specific life that acts in those animals. Were we (*argumenti*

causâ) to imagine shell coextensive with the organized creation, this would produce no abatement in the falsity of the reasoning. Nor does the flaw stop here; for a physiological, that is a real, definition, as distinguished from the verbal definitions of lexicography, must consist neither in any single property or function of the thing to be defined, nor yet in all collectively, which latter, indeed, would be a history, not a definition. It must consist, therefore, in the *law* of the thing, or in such an *idea* of it, as, being admitted, all the properties and functions are admitted by implication. It must likewise be so far *causal*, that a full insight having been obtained of the law, we derive from it a progressive insight into the necessity and *generation* of the phenomena of which it is the law. Suppose a disease in question, which appeared always accompanied with certain symptoms in certain stages, and with some one or more symptoms in all stages—say deranged digestion, capricious alternation of vivacity and languor, headache, dilated pupil, diminished sensibility to light, &c.—Neither the man who selected the one constant symptom, nor he who enumerated all the symptoms, would give the scientific definition *talem scilicet, quali scientia fit vel datur*, but the man who at once named and defined the disease hydrocephalus, producing pressure on the brain. For it is the essence of a scientific definition to be causative, not by introduction of imaginary somewhats, natural or supernatural, under the name of causes, but by announcing the law of action in the particular case, in subordination to the common law of which all the phenomena are modifications or results.

Now in the definition on which, as the representative of a whole class, we are *now* animadverting, a single effect is given as constituting the cause. For nutrition by digestion is certainly necessary to life, only under certain circumstances, but that life is previously necessary to digestion is absolutely certain under all circumstances. Besides, what other phenomenon of Life would the conception of assimilation, *per se*, or as it exists in the lowest order of animals, involve or explain? How, for instance, does it include sensation, locomotion, or habit? or if the two former should be taken as distinct from life, *toto genere*, and supervenient to it, we then ask what conception is given of *vital* assimilation as contradistinguished from that of the nucleus of a crystal?

Lastly, this definition confounds the Law of Life, or the primary and universal form of vital agency, with the conception, Animals. For the kind, it substitutes the representative of its degrees and modifications. But the first and most important office of science, physical or physiological, is to contemplate the power in kind, abstracted from the degree. The ideas of caloric, whether as substance or property, and the conceptions of latent heat, the heat in ice, &c., that excite the wonder or the laughter of the vulgar, though susceptible of the most important practical applications, are the result of this abstraction; while the only purpose to which a definition like the preceding could become subservient, would be in supplying a nomenclature with the character of the most common species of a genus—its *genus generalissimum*, and even this would be useless in the present instance, inasmuch as it presupposes the knowledge of the things characterised.

The third class, and far superior to the two former, selects some property characteristic of all living bodies, not merely found in all *animals* alike, but existing equally in all parts of all living things, both animals and plants. Such, for instance, is the definition of Life, as consisting in anti-putrescence, or the power of resisting putrefaction. Like all the others, however, even this confines the idea of Life to those degrees or concentrations of it, which manifest themselves in organized beings, or rather in those the organization of which is apparent to us. Consequently, it substitutes an abstract term, or generalization of effects, for the idea, or superior form of causative agency. At best, it describes the *vis vitæ* by one only of its many influences. It is however, as we have said before, preferable to the former, because it is not, as they are, altogether unfruitful, inasmuch as it attests, less equivocally than any other sign, the presence or absence of that degree of the *vis vitæ* which is the necessary condition of organic or self-renewing power. It throws no light, however, on the law or principle of action; it does not increase our insight into the other phenomena; it presents to us no *inclusive* form, out of which the other forms may be developed, and finally, its defect as a definition may be detected by generalizing it into a higher formula, as a power which, during its continuance, resists or subordinates heterogeneous and adverse powers. Now this holds equally true of chemical relatively to the mechanical powers; and really affirms no more of Life than may be equally affirmed of every form of being, namely, that it tends to preserve itself, and resists, to a certain extent, whatever is incompatible with the laws that constitute its particular state for the

time being. For it is not true only of the great divisions or classes into which we have found it expedient to distinguish, while we generalize, the powers acting in nature, as into intellectual, vital, chemical, mechanical; but it holds equally true of the degrees, or species of each of these genera relatively to each other: as in the decomposition of the alkalies by heat, or the galvanic spark. Like the combining power of Life, the copula here resists for awhile the attempts to dissolve it, and then yields, to reappear in new phenomena.

It is a wonderful property of the human mind, that when once a momentum has been given to it in a fresh direction, it pursues the new path with obstinate perseverance, in all conceivable bearings, to its utmost extremes. And by the startling consequences which arise out of these extremes, it is first awakened to its error, and either recalled to some former track, or receives some fresh impulse, which it follows with the same eagerness, and admits to the same monopoly. Thus in the 13th century the first science which roused the intellects of men from the torpor of barbarism, was, as in all countries ever has been, and ever must be the case, the science of *Metaphysics* and *Ontology*. We first seek what can be found at home, and what wonder if truths, that appeared to reveal the secret depths of our own souls, should take possession of the whole mind, and all truths appear trivial which could not either be evolved out of similar principles, by the same process, or at least brought under the same forms of thought, by perceived or imagined analogies? And so it was. For more than a century men continued to invoke the oracle of their own spirits, not only concerning its own forms

and modes of being, but likewise concerning the laws of external nature. All attempts at philosophical explication were commenced by a mere effort of the understanding, as the power of abstraction; or by the imagination, transferring its own experiences to every object presented from without. By the former, a class of phenomena were in the first place abstracted, and fixed in some general term: of course this could designate only the impressions made by the outward objects, and so far, therefore, having been thus metamorphosed, they were effects of these objects; but then made to supply the place of their own causes, under the name of occult qualities. Thus the properties peculiar to gold, were abstracted from those it possessed in common with other bodies, and then generalized in the term *Aureity*: and the inquirer was instructed that the Essence of Gold, or the cause which constituted the peculiar modification of matter called gold, was the power of aureity. By the latter, i. e. by the imagination, thought and will were superadded to the occult quality, and every form of nature had its appropriate Spirit, to be controlled or conciliated by an appropriate ceremonial. This was entitled its SUBSTANTIAL FORM. Thus, physic became a sort of dull poetry, and the art of medicine (for physiology could scarcely be said to exist) was a system of magic, blended with traditional empiricism. Thus the forms of thought proceeded to act in their own emptiness, with no attempt to fill or substantiate them by the information of the senses, and all the branches of science formed so many sections of logic and metaphysics. And so it continued, even to the time that the Reformation sounded the second trumpet, and the authority of the schools sank

with that of the hierarchy, under the intellectual courage and activity which this great revolution had inspired. Power, once awakened, cannot rest in one object. All the sciences partook of the new influences. The world of experimental philosophy was soon mapped out for posterity by the comprehensive and enterprising genius of Bacon, and the laws explained by which experiment could be dignified into experience.[1] But no sooner was the impulse given, than the same propensity was made manifest of looking at all things in the one point of view which chanced to be of predominant attraction. Our Gilbert, a man of genuine philosophical genius, had no sooner multiplied the facts of magnetism, and extended our knowledge concerning the property of magnetic bodies, but all things in heaven, and earth, and in the waters beneath the earth, were resolved into *magnetic* influences.

Shortly after a new light was struck by Harriott and Descartes, with their contemporaries, or immediate predecessors, and the restoration of ancient geometry, aided by the modern invention of algebra, placed the science of mechanism on the philosophic throne. How widely this domination spread, and how long it continued, if, indeed, even now it can be said to have abdicated its pretensions, the reader need not be reminded. The sublime discoveries of Newton, and, together with these, his not less fruitful than wonderful application, of the higher mathesis to the movements of the celestial bodies, and to the laws of light, gave almost a religious sanction to the

[1] Experiment, as an organ of reason, not less distinguished from the blind or dreaming industry of the alchemists, than it was successfully opposed to the barren subtleties of the schoolmen.

corpuscular system and mechanical theory. It became synonymous with philosophy itself. It was the sole portal at which truth was permitted to enter. The human body was treated of as an hydraulic machine, the operations of medicine were solved, and alas! even directed by reference partly to gravitation and the laws of motion, and partly by chemistry, which itself, however, as far as its theory was concerned, was but a branch of mechanics working exclusively by imaginary wedges, angles, and spheres. Should the reader chance to put his hand on the 'Principles of Philosophy,' by La Forge, an immediate disciple of Descartes, he may see the phenomena of sleep solved in a copper-plate engraving, with all the figures into which the globules of the blood shaped themselves, and the results demonstrated by mathematical calculations. In short, from the time of Kepler[1] to that of Newton, and from Newton to Hartley, not only all things in external nature, but the subtlest mysteries of life and organization, and even of the intellect and moral being, were conjured within the magic circle of mathematical formulæ. And now a new light was struck by the discovery of electricity, and, in every sense of the word, both playful and serious, both for good and for evil, it may be affirmed to have electrified the whole frame of natural philosophy. Close on its heels followed the momentous discovery of the principal gases by Scheele and Priestly, the composition of water by Cavendish, and the doctrine of latent heat by Black. The scientific world was prepared for a new dynasty; accordingly, as soon as Lavoisier had reduced

[1] Whose own mind, however, was not comprehended in the vortex; where Kepler erred it was in the other extreme.

the infinite variety of chemical phenomena to the actions, reactions, and interchanges of a few elementary substances, or at least excited the expectation that this would speedily be effected, the hope shot up, almost instantly, into full faith, that it had been effected. Henceforward the new path, thus brilliantly opened, became the common road to all departments of knowledge: and, to this moment, it has been pursued with an eagerness and almost epidemic enthusiasm which, scarcely less than its political revolutions, characterise the spirit of the age. Many and inauspicious have been the invasions and inroads of this new conqueror into the rightful territories of other sciences; and strange alterations have been made in less harmless points than those of terminology, in homage to an art unsettled, in the very ferment of imperfect discoveries, and either without a theory, or with a theory maintained only by composition and compromise. Yet this very circumstance has favoured its encroachments, by the gratifications which its novelty affords to our curiosity, and by the keener interest and higher excitement which an unsettled and revolutionary state is sure to inspire. He who supposes that science possesses an immunity from such influences knows little of human nature. How, otherwise, could men of strong minds and sound judgments have attempted to penetrate by the clue of chemical experiment the secret recesses, the sacred adyta of organic life, without being aware that chemistry must needs be at its extreme limits, when it has approached the threshold of a higher power? Its own transgressions, however, and the failure of its enterprises will become the means of defining its absolute boundary, and we shall have to guard

against the opposite error of rejecting its aid altogether as analogy, because we have repelled its ambitious claims to an identity with the vital powers.

Previously to the submitting my own ideas on the subject of life, and the powers into which it resolves itself, or rather in which it is manifested to *us*, I have hazarded this apparent digression from the anxiety to *preclude certain suspicions*, which the subject itself is so fitted to awaken, and while I anticipate the charges, to plead in answer to each a full and unequivocal—not guilty!

In the first place, therefore, I distinctly disclaim all intention of explaining life into an occult quality; and retort the charge on those who can satisfy themselves with defining it as the peculiar power by which death is resisted.

Secondly. Convinced—by revelation, by the consenting authority of all countries, and of all ages, by the imperative voice of my own conscience, and by that wide chasm between man and the noblest animals of the brute creation, which no perceivable or conceivable difference of organization is sufficient to overbridge—that I have a rational and responsible soul, I think far too reverentially of the same to degrade it into an hypothesis, and cannot be blind to the contradiction I must incur, if I assign that soul which I believe to constitute the peculiar nature of man as the cause of functions and properties, which man possesses in common with the oyster and the mushroom.[1]

[1] But still less would I avail myself of its acknowledged inappropriateness to the purposes of physiology, in order to cast a self-complacent sneer on the

Thirdly, while I disclaim the error of Stahl in deriving the phenomena of life from the unconscious actions of the rational soul, I repel with still greater earnestness the assertion and even the supposition that the functions are the offspring of the structure, and "Life[1] the result of organization," connected with it as effect with cause. Nay, the position seems to me little less strange, than as if a man should say, that building with all the included handicraft, of plastering, sawing, planing, &c. were the offspring of the house; and that the mason and carpenter were the result of a suite of chambers, with the passages and staircases that lead to them. To make A the offspring of B, when the very existence of B as B presupposes the existence of A, is preposterous in the *literal* sense of the word, and a consummate instance of the *hysteron proteron* in logic. But if I reject the organ as the *cause* of that, of which it is the organ, though I might admit it among the *conditions* of its actual functions; for the same reason, I must reject *fluids* and *ethers* of all kinds, magnetical, electrical, and universal, to whatever quintessential thinness they may be treble distilled, and (as it were) super-substantiated. With these, I abjure likewise all *chemical* agencies, compositions, and decompositions, were it only that as stimulants they suppose a stimulability *sui generis*, which is but another paraphrase

soul itself, and on all who believe in its existence. First, because in my opinion it would be impertinent; secondly, because it would be imprudent and injurious to the character of my profession; and, lastly, because it would argue an irreverence to the feelings of mankind, which I deem scarcely compatible with a good heart, and a degree of arrogance and presumption which I have never found, except in company with a corrupt taste and a shallow capacity.

[1] Vide Lawrence's Lecture.

for life. Or if they are themselves at once both the excitant and the excitability, I miss the connecting link between this imaginary ether and the visible body, which then becomes no otherwise distinguished from inanimate matter, than by its juxtaposition in mere space, with an heterogeneous inmate, the cycle of whose actions revolves within itself. Besides which I should think that I was confounding metaphors and realities most absurdly, if I imagined that I had a greater insight into the meaning and possibility of a living alcohol, than of a living quicksilver. In short, visible SURFACE and *power* of any kind, much more the *power* of life, are ideas which the very forms of the human understanding make it impossible to identify. But whether the powers which manifest themselves to us under certain conditions in the forms of electricity, or chemical attraction, have any analogy to the power which manifests itself in growth and organization, is altogether a different question, and demands altogether a different chain of reasoning: if it be indeed a tree of knowledge, it will be known by its fruits, and these will depends not on the mere assertion, but on the inductions by which the position is supported, and by the additions which it makes to our insight into the nature of the facts it is meant to illustrate.

To *account* for Life is one thing; to explain Life another. In the first we are supposed to state something prior (if not in time, yet in the order of Nature) to the thing accounted for, as the ground or cause of that thing, or (which comprises the meaning and force of both words) as its *sufficient cause, quæ et facit, et subest.* And to this, in the question of Life, I know no possible answer, but GOD. To account for a thing is to see into the

principle of its possibility, and from that principle to evolve its being. Thus the mathematician demonstrates the truths of geometry by constructing them. It is an admirable remark of Joh. Bapt. a Vico, in a Tract published at Naples, 1710,[1] "Geometrica ideò demonstramus, quia facimus; physica si demonstrare possimus, faceremus. Metaphysici veri claritas eadem ac lucis, quam non nisi per opaca cognoscimus; nam non lucem sed lucidas res videmus. Physica sunt opaca, nempe formata et finita, in quibus Metaphysici veri lumen videmus." The reasoner who assigns structure or organization as the antecedent of Life, who names the former a cause, and the *latter* its effect, *he* it is who pretends to account for life. Now Euclid would, with great right, demand of such a philosopher to *make* Life; in the same sense, I mean, in which Euclid makes an Icosaedron, or a figure of twenty sides, namely, in the understanding or by an intellectual construction. An argument which, of itself, is sufficient to prove the untenable nature of Materialism.

To explain a power, on the other hand, is (the power itself being assumed, though not comprehended, *ut qui datur, non intelligitur*) to unfold or spread it out: *ex implicito planum facere.* In the present instance, such an explanation would consist in the reduction of the idea of Life to its simplest and most comprehensive form or mode of action; that is, to some characteristic *instinct* or *tendency,* evident in all its manifestations, and involved in the idea itself. This assumed as existing in *kind,* it will be required to present an ascending series of correspond-

[1] Joh. Bapt. a Vico, Neapol. Reg. eloq. Professor, de antiquissima Italorum sapientia ex lingua Latina originibus eruendâ: libri tres. Neap., 1710.

ing phenomena as involved *in*, proceeding *from*, and so far therefore explained *by*, the supposition of its progressive intensity and of the gradual enlargement of its sphere, the necessity of which again must be contained in the idea of the tendency itself. In other words, the tendency having been given in *kind*, it is required to render the phenomena intelligible as its different degrees and modifications. Still more perfect will the explanation be, should the necessity of this progression and of these ascending gradations be contained in the assumed idea of life, as thus defined by the general form and common purport of all its various tendencies. This done, we have only to add the conditions common to all its phenomena, and those appropriate to each place and rank, in the scale of ascent, and then proceed to determine the primary and constitutive forms, i. e. the elementary powers in which this tendency realizes itself under different degrees and conditions.[1]

[1] The object I have proposed to myself, and wherein its distinction exists, may be thus illustrated. A complex machine is presented to the common view, the moving power of which is hidden. Of those who are studying and examining it, *one* man fixes his attention on some one application of that power, on certain effects produced by that particular application, and on a certain part of the structure evidently appropriated to the production of these effects, neither the one or other of which he had discovered in a neighbouring machine, which he at the same time asserts to be quite distinct from the former, and to be moved by a power altogether different, though many of the works and operations are, he admits, common to both machines. In this supposed peculiarity he places the essential character of the former machine, and defines it by the presence of that which is, or which he supposes to be, absent in the latter. Supposing that a stranger to both were about to visit the two machines, this peculiarity would be so far useful as that it might enable him to distinguish the one from the other, and thus to look in the proper place for whatever else he had heard remarkable concerning either; not that he or his informant would understand the machine any better or otherwise, than the

What is Life? Were such a question proposed, we should be tempted to answer, what is *not* Life that really *is?* Our reason convinces us that the quantities of things, taken abstractedly as quantity, exist only in the relations they bear to the percipient; in plainer words, they exist

common character of a whole class in the nomenclature of botany would enable a person to understand all, or any one of the plants contained in that class. But if, on the other hand, the machine in question were such as no man was a stranger to, if even the supposed peculiarity, either by its effects, or by the construction of that portion of the works which produced them, were equally well known to all men, in this case we can conceive no use at all of such a definition; for at the best it could only be admitted as a definition for the purposes of nomenclature, which never adds to knowledge, although it may often facilitate its communication. But in this instance it would be nomenclature misplaced, and without an object. Such appears to me to be the case with all those definitions which place the essence of Life in nutrition, contractility, &c. As the second instance, I will take the inventor and maker of the machine himself, who knows its moving power, or perhaps himself constitutes it, who is, as it were, the soul of the work, and in whose mind all its parts, with all their bearings and relations, had pre-existed long before the machine itself had been put together. In him therefore there would reside, what it would be presumption to attempt to acquire, or to pretend to communicate, the most perfect insight not only of the machine itself, and of all its various operations, but of its ultimate principle and its essential causes. The mysterious ground, the efficient causes of vitality, and whether different lives differ absolutely or only in degree, He alone can know who not only said, "Let the earth bring forth the living creature, the beast of the earth after his kind, and it was so;" but who said, "Let us make man in our image, who himself breathed into his nostrils the breath of Life, and *man* became a living soul."

The third case which I would apply to my own attempt would be that of the inquirer, who, presuming to know nothing of the power that moves the whole machine, takes those parts of it which are presented to his view, seeks to reduce its various movements to as few and simple laws of motion as possible, and out of their separate and conjoint action proceeds to explain and appropriate the structure and relative positions of the works. In obedience to the canon,—"Principia non esse multiplicanda præter summam necessitatem cui suffragamur non ideo quia causalem in mundo unitatem vel ratione vel experientiâ perspiciamus, sed illam ipsam indagamus impulsu intellectûs, qui tantandem sibi in explicatione phænomenorum profecisse videtur quantum ab eodem principio ad plurima rationata descendere ipsi concessum est."

only in our minds, *ut quorum esse est percipi.* For if the definite quantities have a ground, and therefore a reality, in the external world, and independent of the mind that perceives them, this ground is *ipso facto* a quality; the very etymon of this world showing that a quality, not taken in its own nature but in relation to another thing, is to be defined *causa sufficiens, entia, de quibus loquimur; esse talia, qualia sunt.* Either the quantities perceived exist only in the perception, or they have likewise a real existence. In the former case, the quality (the word is here used in an active sense) that determines them belongs to Life, *per ipsam hypothesin;* and in the other case, since by the agreement of all parties Life may exist in other forms than those of consciousness, or even of sensibility, the *onus probandi* falls on those who assert of any quality that it is *not* Life. For the analogy of all that we know is clearly in favour of the contrary supposition, and if a man would analyse the meaning of his own words, and carefully distinguish his perceptions and sensations from the external cause exciting them, and at the same time from the quantity or superficies under which that cause is acting, he would instantly find himself, if we mistake not, involuntarily identifying the ideas of Quality and Life. Life, it is admitted on all hands, does not necessarily imply consciousness or sensibility; and we, for our parts, cannot see that the irritability which metals manifest to galvanism, can be more remote from that which may be supposed to exist in the tribe of lichens, or in the helvellæ, pezizæ, &c., than the latter is from the phenomena of excitability in the human body, whatever name it may be called by, or in

whatever way it may modify itself.[1] That the mere act of growth does not constitute the idea of Life, or the absence of that act exclude it, we have a proof in every egg before it is placed under the hen, and in every grain of corn before it is put into the soil. All that could be deduced by fair reasoning would amount to this only, that the life of metals, as the power which effects and determines their comparative cohesion, ductility, &c., was yet lower on the scale than the Life which produces the first attempts of organization, in the almost shapeless tremella, or in such fungi as grow in the dark recesses of the mine.

If it were asked, to what purpose or with what view we should generalize the idea of Life thus broadly, I should not hesitate to reply that, were there no other use conceivable, there would be *some* advantage in merely destroying an arbitrary assumption in natural philosophy, and in reminding the physiologists that they could not hear the life of metals asserted with a more contemptuous surprise than they themselves incur from the vulgar, when they speak of the Life in mould or mucor. But this is not the case. This wider view not only precludes a groundless assumption, it likewise fills up the arbitrary chasm between physics and physiology, and justifies us in using the former as means of insight into the latter, which would be contrary to all sound rules of ratiocination if the powers working in the objects of the two sciences were absolutely

[1] The arborescent forms on a frosty morning, to be seen on the window and pavement, must have *some* relation to the more perfect forms developed in the vegetable world.

and essentially diverse. For as to abstract the idea of *kind* from that of *degrees,* which are alone designated in the language of common use, is the first and indispensable step in philosophy, so are we the better enabled to form a notion of the *kind,* the lower the *degree* and the simpler the form is in which it appears to us. We study the complex in the simple; and only from the intuition of the lower can we safely proceed to the intellection of the higher degrees. The only danger lies in the leaping from low to high, with the neglect of the intervening gradations. But the same error would introduce discord into the gamut, *et ab abusu contra usum non valet consequentia.* That these degrees will themselves bring forth secondary kinds sufficiently distinct for all the purposes of science, and even for common sense, will be seen in the course of this inquisition: for this is one proof of the essential vitality of nature, that she does not ascend as links in a suspended chain, but as the steps in a ladder; or rather she at one and the same time *ascends* as by a climax, and expands as the concentric circles on the lake from the point to which the stone in its fall had given the first impulse. At all events, a contemptuous rejection of this mode of reasoning would come with an ill grace from a medical philosopher, who cannot combine any three phenomena of health or of disease without the assumption of powers, which he is compelled to deduce without being able to demonstrate; nay, even of material substances as the *vehicles* of these powers, which he can never expect to exhibit before the senses.

From the preceding it should appear, that the most comprehensive formula to which life is reducible, would

be that of the internal copula of bodies, or (if we may venture to borrow a phrase from the Platonic school) the *power* which discloses itself from within as a principle of *unity* in the *many*. But that there is a physiognomy in words, which, without reference to their fitness or necessity, make unfavorable as well as favorable impressions, and that every unusual term in an abstruse research incurs the risk of being denominated jargon, I should at the same time have borrowed a scholastic *term*, and defined life *absolutely*, as the principle of unity in *multeity*, as far as the former, the unity to wit, is produced *ab intra;* but *eminently* (*sensu eminenti*), I define life as *the principle of individuation*, or the power which unites a given *all* into a *whole* that is presupposed by all its parts. The link that combines the two, and acts throughout both, will, of course, be defined by the *tendency* to *individuation*. Thus, from its utmost *latency*, in which life is one with the elementary powers of mechanism, that is, with the powers of mechanism considered as qualitative and actually synthetic, to its highest manifestation, (in which, as the *vis vitæ vivida*, or life *as* life, it subordinates and modifies these powers, becoming contra-distinguished from mechanism,[1] *ab extra*, under the form of organization,) there is an ascending series of intermediate classes, and of analogous gradations in each class. To a reflecting mind, indeed, the very fact that the powers peculiar to life in living animals *include* cohesion, elasticity, &c. (or, in the words of a late publication, "that living matter exhibits

[1] Thus we may say that whatever is organized from without, is a product of mechanism; whatever is mechanised from within, is a production of organization.

these physical properties,"[1] would demonstrate that, in the truth of things, they are homogeneous, and that both the classes are but degrees and different dignities of one and the same tendency. For the latter are not subjected to the former as a lever, or walking-stick to the muscles; the more intense the life is, the less does *elasticity*, for instance, appear *as* elasticity. It sinks down into the nearest approach to its *physical* form by a series of degrees from the contraction and elongation of the irritable muscle to the physical hardness of the insensitive nail. The lower powers are *assimilated*, not merely *employed*, and assimilation presupposes the homogeneous nature of the thing assimilated; else it is a miracle, only not the same as that of a *creation*, because it would imply that additional and equal miracle of annihilation. In short, all the impossibilities which the acutest of the reformed Divines have detected in the hypothesis of transubstantiation would apply, *totidem verbis et syllabis*, to that of assimilation, if the objects and the agents were really heterogeneous. Unless, therefore, a thing can exhibit properties which do not belong to it, the very admission that living matter exhibits *physical* properties, includes the further admission, that those physical or dead properties are themselves vital in essence, really *distinct* but

[1] "The matter that surrounds us is divided into two great classes, living and dead; the latter is governed by physical laws, such as attraction, gravitation, chemical affinity; and it exhibits physical properties, such as cohesion, elasticity, divisibility, &c. Living matter also exhibits these properties, and is subject, in great measure, to physical laws. But living bodies are endowed moreover with a set of properties altogether different from these, and contrasting with them very remarkably." (Vide Lawrence's Lectures, p. 121.)

in appearance only *different;* or in absolute contrast with each other.

In all cases that which, *abstractly* taken, is the definition of the *kind,* will, when applied *absolutely,* or in its fullest sense, be the definition of the highest *degree* of that kind. If life, in general, be defined *vis ab intra, cujus proprium est coadunare plura in rem unicam, quantùm est res unica;* the unity will be more intense in proportion as it constitutes each particular thing a whole of itself; and yet more, again, in proportion to the number and interdependence of the parts, which it unites as a whole. But a whole composed, *ab intra,* of different parts, so far interdependent that each is reciprocally means and end, is an individual, and the individuality is most intense where the greatest dependence of the parts on the whole is combined with the greatest dependence of the whole on its parts; the first (namely, the dependence of the parts on the whole) being absolute; the second (namely, the dependence of the whole on its parts) being proportional to the importance of the relation which the parts have to the whole, that is, as their action extends more or less beyond themselves. For this spirit of the whole is most expressed in that part which derives its importance as an End from its importance as a Mean, relatively to all the parts under the same copula.

Finally, of individuals, the living power will be most intense in that individual which, as a whole, has the greatest number of integral parts presupposed in it; when, moreover, these integral parts, together with a proportional increase of their interdependence, as *parts,* have themselves most

the character of wholes in the sphere occupied by them. A mathematical point, line, or surface, is an *ens rationis*, for it expresses an intellectual act; but a physical atom is *ens fictitium*, which may be made subservient, as ciphers are in arithmetic, to the purposes of hypothetical construction, *per regulam falsi;* but transferred to *Nature*, it is in the strictest sense an *absurd* quantity; for extension, and consequently divisibility, or *multeity*,[1] (for space cannot be divided,) is the indispensable condition, under which alone anything can *appear* to us, or even be *thought* of, as a *thing*. But if it should be replied, that the elementary particles are atoms not positively, but by such a hardness communicated to them as is relatively invincible, I should remind the assertor that *temeraria citatio supernaturalium est pulvinar intellectûs pigri*, and that he who requires me to believe a miracle of his own dreaming, must first work a miracle to convince me that he had dreamt by inspiration. Add, too, the gross inconsistency of resorting to an immaterial influence in order to complete a system of materialism, by the exclusion of all modes of existence which the theorist cannot in imagination, at least, *finger* and *peep* at! Each of the preceding gradations, as above defined, might be represented as they exist, and are realised in Nature. But each would require a work for itself,

[1] Much against my will I repeat this scholastic term, *multeity*, but I have sought in vain for an unequivocal word of a less repulsive character, that would convey the notion in a positive and not comparative sense in kind, as opposed to the *unum et simplex*, not in degree, as contracted with the *few*. We can conceive no reason that can be adduced in justification of the word *caloric*, as invented to distinguish the external cause of the sensation heat, which would not equally authorise the introduction of a technical term in this instance.

co-extensive with the science of metals, and that of fossils (both as geologically applied); of crystallization; and of vegetable and animal physiology, in all its distinct branches. The nature of the present essay scarcely permits the space sufficient to illustrate our meaning. The proof of its probability (for to that only can we arrive by so partial an application of the hypothesis), is to be found in its powers of solving the particular class of phenomena, that form the subjects of the present inquisition, more satisfactorily and profitably than has been done, or even attempted before.

Exclusively, therefore, for the purposes of *illustration*, I would take as an instance of the first step, the metals, those, namely, that are capable of permanent reduction. For, by the established laws of nomenclature, the others (as sodium, potassium, calcium, silicium, &c.) would be entitled to a class of their own, under the name of *bases*. It is long since the chemists have despaired of decomposing this class of bodies. They still remain, one and all, as elements or simple bodies, though, on the principles of the corpuscularian philosophy, nothing can be more improbable than that they really are such; and no reason has or can be assigned on the grounds of that system, why, in no one instance, the contrary has not been proved. But this is at once explained, if we assume them as the simplest form of unity, namely, the unity of powers and properties. For these, it is evident, may be endlessly modified, but can never be decomposed. If I were asked by a philosopher who had previously extended the attribute of Life to the *Byssus speciosa*, and even to the crustaceous matter, or outward bones of a lobster, &c., whether

the ingot of gold expressed *life*, I should answer without hesitation, as the *ingot* of gold assuredly not, for its form is accidental and *ab extra*. It may be added to or detracted from without in the least affecting the nature, state, or properties in the specific matter of which the ingot consists. But as *gold*, as that special union of absolute and of relative gravity, ductility, and hardness, which, wherever they are found, constitute *gold*, I should answer no less fearlessly, in the affirmative. But I should further add, that of the two counteracting tendencies of nature, namely, that of *detachment* from the universal life, which universality is represented to us by gravitation, and that of *attachment* or reduction into it, this and the other noble metals represented the units in which the latter tendency, namely, that of identity with the life of nature, subsisted in the greatest overbalance over the former. It is the form of unity with the least degree of tendency to individuation.

Rising in the ascent, I should take, as illustrative of the second step, the various forms of crystals as a union, not of powers only, but of parts, and as the simplest forms of composition in the next narrowest sphere of affinity. Here the form, or apparent *quantity*, is manifestly the result of the *quality*, and the chemist himself not seldom admits them as infallible characters of the substances united in the whole of a given crystal.

In the first step, we had Life, as the mere *unity* of powers; in the second we have the simplest forms of *totality* evolved. The third step is presented to us in those vast formations, the tracing of which generically would form the science of Geology, or its history in the

strict sense of the word, even as their description and diagnostics constitute its preliminaries.

Their claim to this rank I cannot here even attempt to support. It will be sufficient to explain my reason for having assigned it to them, by the avowal, that I regard them in a twofold point of view: 1st, as the residue and product of vegetable and animal life; 2d, as manifesting the tendencies of the Life of Nature to vegetation or animalization. And this process I believe—in one instance by the peat morasses of the northern, and in the other instance by the coral banks of the southern hemisphere —to be still connected with the present order of vegetable and animal Life, which constitute the fourth and last step in these wide and comprehensive divisions.

In the lowest forms of the vegetable and animal world we perceive totality dawning into *individuation*, while in man, as the highest of the class, the individuality is not only perfected in its corporeal sense, but begins a new series beyond the appropriate limits of physiology. The tendency to individuation, more or less obscure, more or less obvious, constitutes the common character of all classes, as far as they maintain for themselves a distinction from the universal life of the planet; while the degrees, both of intensity and extension, to which this tendency is realized, form the species, and their ranks in the great scale of ascent and expansion.

In the treatment of a subject so vast and complex, within the limits prescribed for an essay like the present, where it is impossible not to say either too much or too little (and too much because too little), an author is entitled to make large claims on the candour of his judges. Many

things he must express inaccurately, not from ignorance or oversight, but because the more precise expression would have involved the necessity of a further explanation, and this another, even to the first elements of the science. This is an inconvenience which presses on the analytic method, on however large a scale it may be conducted, compared with the synthetic; and it must bear with a tenfold weight in the present instance, where we are not permitted to avail ourselves of its usual advantages as a counterbalance to its inherent defects. I shall have done all that I dared propose to myself, or that can be justly demanded of me by others, if I have succeeded in conveying a sufficiently clear, though indistinct and inadequate notion, so as of its many results to render intelligible that one which I am to apply to my particular subject, not as a truth already demonstrated, but as an hypothesis, which pretends to no higher merit than that of explaining the particular class of phenomena to which it is applied, and asks no other reward than a presumption in favour of the general system of which it affirms itself to be a dependent though integral part. By Life I everywhere mean the true Idea of Life, or that most general form under which Life manifests itself to us, which includes all its other forms. This I have stated to be the *tendency to individuation*, and the degrees or intensities of Life to consist in the progressive realization of this tendency. The power which is acknowledged to exist, wherever the realization is found, must subsist wherever the tendency is manifested. The power which comes forth and stirs abroad in the bird, must be latent in the egg. I have shown, moreover, that this tendency to

individuate cannot be conceived without the opposite tendency to connect, even as the centrifugal power supposes the centripetal, or as the two opposite poles constitute each other, and are the constituent acts of one and the same power in the magnet. We might say that the life of the magnet subsists in their union, but that it lives (acts or manifests itself) in their strife. Again, if the tendency be at once to individuate and to connect, to detach, but so as either to retain or to reproduce attachment, the individuation itself must be a tendency to the ultimate production of the highest and most comprehensive individuality. This must be the one great end of Nature, her ultimate object, or by whatever other word we may designate that something which bears to a final cause the same relation that Nature herself bears to the Supreme Intelligence.

According to the plan I have prescribed for this inquisition, we are now to seek for the highest law, or most general form, under which this tendency acts, and then to pursue the same process with this, as we have already done with the tendency itself, namely, having stated the law in its highest abstraction, to present it in the different forms in which it appears and reappears in higher and higher dignities. I restate the question. The tendency having been ascertained, what is its most general law? I answer—*polarity*, or the essential dualism of Nature, arising out of its productive unity, and still tending to reaffirm it, either as equilibrium, indifference, or identity. In its *productive* power, of which the product is the only measure, consists its incompatibility with mathematical

calculus. For the full applicability of an abstract science ceases, the moment reality begins.[1] Life, then, we consider as the copula, or the unity of thesis and antithesis, position and counterposition,—Life itself being the positive of both; as, on the other hand, the two counterpoints are the necessary conditions of the *manifestations* of Life. These, by the same necessity, unite in a synthesis; which again, by the law of dualism, essential to all actual existence, expands, or *produces* itself, from the point into the *line*, in order again to converge, as the initiation of the same productive process in some intenser form of reality. Thus, in the identity of the two counter-powers, Life *sub*sists; in their strife it *con*sists: and in their re-

[1] For abstractions are the conditions and only subject of all abstract sciences. Thus the theorist (vide Dalton's Theory), who reduces the chemical process to the positions of atoms, would doubtless thereby render chemistry calculable, but that he commences by destroying the chemical process itself, and substitutes for it a *mote dance* of abstractions; for even the powers which he appears to leave real, those of attraction and repulsion, he immediately unrealizes by representing them as diverse and separable properties. We can abstract the quantities and the quantitative motion from masses, passing over or leaving for other sciences the question of what constitutes the masses, and thus apply not to the masses themselves, but to the abstractions therefrom,—the laws of geometry and universal arithmetic. And where the quantities are the infallible signs of real powers, and our chief concern with the masses is as SIGNS, sciences may be founded thereon of the highest use and dignity. Such, for instance, is the sublime science of astronomy, having for its objects the vast masses which "God placed in the firmament of the heaven to be for *signs* and for seasons, for days and years." For the whole doctrine of physics may be reduced to three great divisions: First, *quantitative motion*, which is proportioned to the quantity of matter exclusively. This is the science of weight or statics. Secondly, *relative motion*, as communicated to bodies externally by impact. This is the science of mechanics. Thirdly, *qualitative motion*, or that which is accordant to properties of matter. And this is chemistry. Now it is evident that the first two sciences presuppose that which forms the exclusive object of the third, namely, quality; for all quantity in nature is either itself derived, or at least derives its powers from some *quality*, as that of weight, specific cohesion, hardness, &c.; and therefore the attempt to re-

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conciliation it at once dies and is born again into a new form, either falling back into the life of the whole, or starting anew in the process of individuation.

Whence shall we take our beginning? From Space, *istud litigium philosophorum*, which leaves the mind equally dissatisfied, whether we deny or assert its real existence. To make it wholly ideal, would be at the same time to idealize all phenomena, and to undermine the very conception of an external world. To make it real, would be to assert the existence of something, with the properties of nothing. It would far transcend the height to which a physiologist must confine his flights, should we attempt to reconcile this apparent contradiction. It is the duty and the privilege of the theologian to demonstrate, that *space* is the ideal organ by which the soul of man perceives the *omnipresence* of the Supreme Reality, as distinct from the works, which in him move, and live,

duce to the distances or impacts of atoms, under the assumptions of two powers, which are themselves declared to be no more than mere general terms for those quantities of motion and impact (the atom itself being a fiction formed by abstraction, and in truth a third occult quality for the purpose of explaining hardness and density), amounts to an attempt to destroy chemistry itself, and at the same time to exclude the sole reality and only positive contents of the very science into which that of chemistry is to be degraded. Now what qualities are to chemistry, *productiveness* is to the science of Life; and this being excluded, physiology or zoonomy would sink into chemistry, chemistry by the same process into mechanics, while mechanics themselves would lose the substantial principle, which, bending the lower extreme towards its apex, produces the organic circle of the sciences, and elevates them all into different arcs or stations of the one absolute science of Life.

This explanation, which in appearance only is a digression, was indispensably requisite to prevent the idea of polarity, which has been given as the universal law of Life, from being misunderstood as a mere refinement on those mechanical systems of physiology, which it has been my main object to explode.

and have their being; while the equal mystery of *Time* bears the same relation to his *Eternity*, or what is fully equivalent, his Unity.

Physiologically contemplated, Nature begins, proceeds, and ends in a contradiction; for the moment of absolute solution would be that in which Nature would cease to be Nature, i. e. a scheme of ever-varying relations; and physiology, in the ambitious attempt to solve phenomena into absolute realities, would itself become a mere web of verbal abstractions.

But it is in strict connexion with our subject, that we should make the universal FORMS as well as the not less universal LAW of Life, clear and intelligible in the example of *Time* and *Space*, these being both the first specification of the principle, and ever after its indispensable symbols. First, a single act of self-inquiry will show the impossibility of distinctly conceiving the one without some involution of the other; either time expressed in space, in the form of the mathematical line, or space within time, as in the circle. But to form the first conception of a *real* thing, we state both as one in the idea, *duration*. The formula is: $\overbrace{A=B+B=A}=\overbrace{A=A}$, or the oneness of space and time, is the predicate of all *real* being.

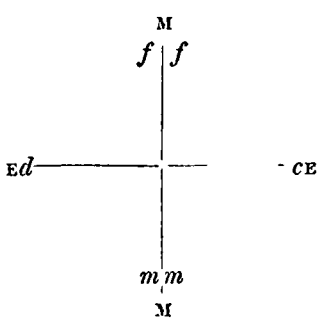
But as little can we conceive the oneness, except as the mid-point produciug itself on each side; that is, manifesting itself on two opposite poles. Thus, from identity we derive duality, and from both together we obtain polarity, synthesis, indifference, predominance. The line is Time + Space, under the predominance of Time: Surface is Space + Time, under the predominance of Space, while Line + Surface as the synthesis of

units, is the circle in the first dignity; to the sphere in the second; and to the globe in the third. In short, neither can the antagonists appear but as two forces of one power, nor can the power be conceived by us but as the equatorial point of the two counteracting forces; of which the *hypomochlion* of the lever is as good an illustration as anything can be that is thought of *mechanically* only, and exclusively of life. To make it adequate, we must substitute the idea of positive production for that of rest, or mere neutralization. To the fancy alone it is the null-point, or zero, but to the reason it is the *punctum saliens*, and the power itself in its eminence. Even in these, the most abstract and universal forms of all thought and perception—even in the ideas of time and space, we slip under them, as it were, a *substratum*; for we cannot think of them but as far as they are co-inherent, and therefore as reciprocally the measures of each other. Nor, again, can we finish the process without having the idea of *motion* as its immediate product. Thus we say, that time has one dimension, and imagine it to ourselves as a line. But the line we have already proved to be the productive synthesis of time, with space under the predominance of time. If we exclude space by an abstract assumption, the time remains as a spaceless point, and represents the concentered power of unity and active negation, i. e. retraction, determination, and limit, *ab intra*. But if we assume the time as excluded, the line vanishes, and we leave space dimensionless, an indistinguishable ALL, and therefore the representative of absolute weakness and formlessness, but, for that very reason, of infinite capacity and formability.

We have been thus full and express on this subject, because these simple ideas of time, space, and motion; of length, breadth, and depth, are not only the simplest and universal, but the necessary symbols of all philosophic construction. They will be found the primary factors and elementary forms of every calculus and of every diagram in the algebra and geometry of a scientific physiology. Accordingly, we shall recognise the same forms under other names; but at each return more specific and intense; and the whole process repeated with ascending gradations of reality, *exempli gratiâ*: Time + space = motion; TM + space = line + breadth = depth; depth + motion = force; L*f* + B*f* = D*f*; LD*f* + BD*f* = attraction + repulsion = gravitation; and so on, even till they pass into outward phenomena, and form the intermediate link between productive powers and fixed products in light, heat, and electricity. If we pass to the construction of matter, we find it as the product, or *tertium aliud*, of antagonist powers of repulsion and attraction. Remove these powers, and the conception of matter vanishes into space—conceive repulsion only, and you have the same result. For infinite repulsion, uncounteracted and alone, is tantamount to infinite, dimensionless diffusion, and this again to infinite weakness; viz., to space. Conceive attraction alone, and as an infinite contraction, its product amounts to the absolute point, viz., to time. Conceive the synthesis of both, and you have matter as a fluxional antecedent, which, in the very act of formation, passes into body by its gravity, and yet in all bodies it still remains as their mass, which, being exclusively calculable under the law of gravitation, gives

rise, as we before observed, to the science of statics, most improperly called celestial mechanics.

In strict consistence with the same philosophy which, instead of considering the powers of bodies to have been miraculously stuck into a prepared and pre-existing matter, as pins into a pin-cushion, conceives the powers as the productive factors, and the body or phenomenon as the fact, product, or fixture; we revert again to potentiated length in the power of magnetism; to surface in the power of electricity; and to the synthesis of both, or potentiated depth, in constructive, that is, chemical affinity. But while the two factors are as poles to each other, each factor has likewise its own poles, and thus in the simple cross—



M M being the magnetic line, with *f f* its northern pole, or pole of attraction; and *m m* its south, or pole of repulsion, and E E one of the lines that spring from each point of M M, with its east, or pole of contraction, and *d* its west, or pole of diffluence and expansion—we have presented to us the universal quadruplicity, or four elemental forms of power; in the endless proportions and

modifications of which, the innumerable offspring of all-bearing Nature consist. Wisely docile to the suggestions of Nature herself, the ancients significantly expressed these forces under the names of earth, water, air, and fire; not meaning any tangible or visible substance so generalized, but the powers predominant, and, as it were, the living basis of each, which no chemical decomposition can ever present to the senses, were it only that their interpenetration and co-inherence first constitutes them sensible, and is the condition and meaning of a—*thing*. Already our more truly philosophical naturalists (Ritter, for instance) have begun to generalize the four great elements of chemical nomenclature, carbon, azote, oxygen, and hydrogen: the two former as the positive and negative pole of the magnetic axis, or as the power of fixity and mobility; and the two latter as the opposite poles, or plus and minus states of cosmical electricity, as the powers of contraction and dilatation, or of comburence and combustibility. These powers are to each other as longitude to latitude, and the poles of each relatively as north to south, and as east to west. For surely the reader will find no distrust in a system only because Nature, ever consistent with herself, presents us everywhere with harmonious and accordant symbols of her consistent doctrines. Nothing would be more easy than, by the ordinary principles of sound logic and common sense, to demonstrate the impossibility and expose the absurdity of the corpuscularian or mechanic system, or than to prove the untenable nature of any intermediate system. But we cannot force any man into an insight or intuitive possession of the true philosophy, because we cannot give him abstraction, intellectual

intuition, or constructive imagination; because we cannot organize for him an eye that can see, an ear that can listen to, or a heart that can feel, the harmonies of Nature, or recognise in her endless forms, the thousand-fold realization of those simple and majestic laws, which yet in their absoluteness can be discovered only in the recesses of his own spirit,—not by that man, therefore, whose imaginative powers have been *ossified* by the continual reaction and assimilating influences of mere *objects* on his mind, and who is a prisoner to his own eye and its reflex, the passive fancy!—not by him in whom an unbroken familiarity with the organic world, as if it were mechanical, with the sensitive, but as if it were insensate, has engendered the coarse and hard spirit of a sorcerer. The former is unable, the latter unwilling, to master the absolute pre-requisites. There is neither hope nor occasion for him "to cudgel his brains about it, he has no feeling of the business." If he do not see the necessity from without, if he have not learned the possibility from within, of interpenetration, of total intussusception, of the existence of all in each as the condition of Nature's unity and substantiality, and of the latency under the predominance of some one power, wherein subsists her life and its endless variety, as he must be, by habitual slavery to the eye, or its reflex, the passive fancy, under the influences of the corpuscularian philosophy, he has so paralysed his imaginative powers as to be unable—or by that hardness and heart-hardening spirit of contempt, which is sure to result from a perpetual commune with the lifeless, he has so far debased his inward being—as to be unwilling to comprehend the pre-requisite, he must be content, while standing

thus at the threshold of philosophy, to receive the results, though he cannot be admitted to the deliberation—in other words, to act upon *rules* which he is incapable of understanding as LAWS, and to reap the harvest with the sharpened iron for which others have delved for him in the mine.

It is not improbable that there may exist, and even b discovered, higher forms and more akin to Life than those of magnetism, electricity, and constructive (or chemical) affinity appear to be, even in their finest known influences. It is not improbable that we may hereafter find ourselves justified in revoking certain of the latter, and unappropriating them to a yet unnamed triplicity; or that, being thus assisted, we may obtain a qualitative instead of a quantitative insight into vegetable animation, as distinct from animal, and that of the insect world from both. But in the present state of science, the magnetic, electric, and chemical powers are the last and highest of inorganic nature. These, therefore, we assume as presenting themselves again to us, in their next metamorphosis, as reproduction (i. e. growth and identity of the whole, amid the change or flux of all the parts), irritability and sensibility; reproduction corresponding to magnetism, irritability to electricity, and sensibility to constructive chemical affinity.

But before we proceed further, it behoves us to answer the objections contained in the following passage, or withdraw ourselves in time from the bitter contempt in which it would involve us. Acting under such a necessity, we need not apologise for the length of the quotation.

1. "If," says Mr. Lawrence, "the properties of living matter are to be explained in this way, why should not we adopt the same plan with physical properties, and account for gravitation, or chemical affinity, by the supposition of appropriate subtile fluids? Why does the irritability of a muscle need such an explanation, if explanation it can be called, more than the elective attraction of a salt?"

2. "To make the matter more intelligible, this vital principle is compared to magnetism, to electricity, and to galvanism; or it is roundly stated to be oxygen. 'Tis like a camel, or like a whale, or like what you please."

3. "You have only to grant that the phenomena of the sciences just alluded to depend on extremely fine and invisible fluids, superadded to the matters in which they are exhibited, and to allow further that Life, and magnetic, galvanic, and electric phenomena correspond perfectly; the existence of a subtile matter of Life will then be a very probable inference."

4. "On this illustration you will naturally remark, that the existence of the magnetic, electric, and galvanic fluids, which is offered as a proof of the existence of a vital fluid, is as much a matter of doubt as that of the vital fluid itself."

5. "It is singular, also, that the vital principle should be like both magnetism and electricity, when these two are not like each other."

6. "It would have been interesting to have had this illustration prosecuted a little further. We should have been pleased to learn whether the human body is more like a loadstone, a voltaic pile, or an electrical machine; whether the organs are to be regarded as Leyden jars, magnetic needles, or batteries."

7. "The truth is, there is no resemblance, no analogy, between Electricity and Life; the two orders of phenomena are completely distinct; they are incommensurable. Electricity illustrates life no more than life illustrates electricity." [1]

To avoid unnecessary description, I shall refer to the passages by the numbers affixed to them, for that purpose, in the margin.

[1] I apprehend that by men of a certain school it would be deemed no demerit, even though they should never have condescended to look into any system of Aristotelian logic. It is enough for these gentlemen that they are experimentalists! Let it not, however, be supposed that they make more experiments than their neighbours, who consider induction as a means and not an end; or have stronger motives for making them, unless it can be believed that Tycho Brähe must have been urged to repeat his sweeps of the heavens with greater accuracy and industry than Herschel, for no better reason than that the former flourished before the theory of gravitation was perfected. No, but they have the honour of being mere experimentalists! If, however, we may not refer to logic, we may to common sense and common experience. It is not improbable, however, that they have both read and studied a book of hypothetical psychology on the assumptions of the crudest materialism, stolen too without acknowledgment from our David Hartley's essay on Man, which is well known under the whimsical name of Condillac's Logic. But, as Mr. Brand has lately observed, "the French are a queer people," and we should not be at all surprised to hear of a book of fresh importation from Paris, on determinate proportions in chemistry, announced by the author in his title-page as a new and improved system either of arithmetic or geometry.

In reply to No. 1, I ask whether, in the nature of the mind, illustration and explanation must not of necessity proceed from the lower to the higher? or whether a boy is to be taught his addition, subtraction, multiplication, and division, by the highest branches of algebraic analysis? Is there any better way of systematic teaching, than that of illustrating each new step, or having each new step illustrated to him by its identity in kind with the step the next below it? though it be the only mode in which this objection can be answered, yet it seems affronting to remind the objector, of rules so simple as that the complex must even be illustrated by the more simple, or the less scrutible by that which is more subject to our examination.

In reply to No. 2, I first refer to the author's eulogy on Mr. Hunter, p. 163, in which he is justly extolled for having "surveyed the whole *system* of organized beings, from plants to man:" of course, therefore, *as* a *system;* and therefore under some *one common law.* Now in the very same sense, and no other, than that in which the writer himself by implication compares himself as a man to the *dermestes typographicus,* or the *fucus scorpioides,* do I compare the principle of Life to magnetism, electricity, and constructive affinity,—or rather to that power to which the two former are the thesis and antithesis, the latter the synthesis. But if to compare involve the sense of its etymon, and involve the sense of parity, I utterly deny that I do at all compare them; and, in truth, in no conceivable sense of the word is it applicable, any more than a geometrician can be affirmed to compare a polygon to a point, because he generates the line out of the point. The writer attributes to a philosophy essen-

tially vital the barrenness of the mechanic system, with which alone his imagination has been familiarised, and which, as hath been justly observed by a contemporary writer, is contradistinguished from the former principally in this respect; that demanding for every mode and act of existence real or possible visibility, it knows only of distance and nearness, composition (or rather compaction) and decomposition, in short, the relations of unproductive particles to each other; so that in every instance the result is the exact sum of the component qualities, as in arithmetical addition. This is the philosophy of Death, and only of a dead nature can it hold good. In Life, and in the view of a vital philosophy, the two component counter-powers actually interpenetrate each other, and generate a higher third, including both the former, "ita tamen ut sit alia et major."

As a complete answer to No. 3, I refer the reader to many passages in the preceding and following pages, in which, on far higher and more demonstrative grounds than the mechanic system can furnish, I have exposed the unmeaningness and absurdity of these finer fluids, as applied even to electricity itself; unless, indeed, they are assumed as its product. But in addition I beg leave to remind the author, that it is incomparably more agreeable to all experience to originate the formative process in the *fluid*, whether fine or gross, than in corporeal *atoms*, in which we are not only deserted by all experience, but contradicted by the primary conception of body itself.

Equally inapplicable is No. 4: and of No. 5 I can only repeat, first, that I do not make Life *like* magnetism, or *like* electricity; that the difference between

magnetism and electricity, and the powers illustrated by them, is an essential part of my system, but that the animal Life of man is the identity of all three. To whatever other system this objection may apply, it is utterly irrelevant to that which I have here propounded: though from the narrow limits prescribed to me, it has been propounded with an inadequacy painful to my own feelings.

The ridicule in No. 6 might be easily retorted; but as it could prove nothing, I will leave it where I found it, in a page where nothing is proved.

A similar remark might be sufficient for the bold and blank assertion (No. 7) with which the extract concludes; but that I feel some curiosity to discover what meaning the author attaches to the term analogy. Analogy implies a difference in sort, and not merely in degree; and it is the sameness of the end, with the difference of the means, which constitutes analogy. No one would say the lungs of a man were analogous to the lungs of a monkey, but any one might say that the gills of fish and the spiracula of insects are analogous to lungs. Now if there be any philosophers who have asserted that electricity as electricity is the *same* as Life, for that reason they cannot be *analogous* to each other; and as no man in his senses, philosopher or not, is capable of imagining that the lightning which destroys a sheep, was a means to the same end with the principle of its organization; for this reason, too, the two powers cannot be represented as analogous. Indeed I know of no system in which the word, as thus applied, would admit of an endurable meaning, but that which teaches us, that a mass of marrow in the skull is analogous to the rational soul, which Plato and Bacon, equally

with the "poor Indian," believe themselves to have received from the Supreme Reason.

It would be blindness not to see, or affectation to pretend not to see, the work at which these sarcasms were levelled. The author of that work is abundantly able to defend his own opinions; yet I should be ambitious to address *him* at the close of the contest in the lines of the great Roman poet:

> "Et nos tela, Pater, ferrumque haud debile dextrâ
> Spargimus, et nostro sequitur, de vulnere sanguis."

In Mr. Abernethy's Lecture on the Theory of Life, it is impossible not to see a presentiment of a great truth. He has, if I may so express myself, caught it in the breeze: and we seem to hear the first glad opening and shout with which he springs forward to the pursuit. But it is equally evident that the prey has not been followed through its doublings and windings, or driven out from its brakes and covers into full and open view. Many of the least tenable phrases may be fairly interpreted as illustrations, rather than precise exponents of the author's meaning; at least, while they remain as a mere suggestion or annunciation of his ideas, and till he has expanded them over a larger sphere, it would be unjust to infer the contrary. But it is not with men, however strongly their professional merits may entitle them to reverence, that my concern is at present. If the opinions here supported are the same with those of Mr. Abernethy, I rejoice in his authority. If they are different, I shall wait with an anxious interest for an exposition of that difference

Having reasserted that I no more confound magnetism with electricity, or the chemical process, than the mathematician confounds length with breadth, or either with depth; I think it sufficient to add that there are two views of the subject, the former of which I do not believe attributable to any philosopher, while both are alike disclaimed by me as forming any part of my views. The first is that which is supposed to consider electricity identical with life, as it subsists in organized bodies. The other considers electricity as everywhere present, and penetrating all bodies under the image of a subtile fluid or substance, which, in Mr. Abernethy's inquiry, I regard as little more than a mere diagram on his slate, for the purpose of fixing the attention on the intellectual conception, or as a possible *product*, (in which case electricity must be a composite power,) or at worst, as words *quæ humana incuria fudit*. This which, in inanimate Nature, is manifested now as magnetism, now as electricity, and now as chemical agency, is supposed, on entering an organized body, to constitute its vital *principle*, something in the same manner as the steam becomes the *mechanic* power of the steam-engine, in *consequence* of its compression by the steam-engine; or as the breeze that murmurs indistinguishably in the forest becomes the element, the substratum, of melody in the Æolian harp, and of consummate harmony in the organ. Now this hypothesis is as directly opposed to my view as supervention is to evolution, inasmuch as I hold the organized body itself, in all its marvellous contexture, to be the PRODUCT and representant of the power which is here supposed to have supervened to it. So far from admitting a *transfer*, I

do not admit it even in electricity itself, or in the phenomena universally called electrical; among other points I ground my explanation of remote sympathy on the directly contrary supposition.

But my opinions will be best explained by a rapid exemplification in the processes of Nature, from the first rudiments of individualized life in the lowest classes of its two great poles, the vegetable and animal creation, to its crown and consummation in the human body; thus illustrating at once the unceasing *polarity of life, as the form of its process, and its tendency to progressive individuation as the law of its direction.*

Among the conceptions, of the mere ideal character of which the philosopher is well aware, and which yet become necessary from the necessity of assuming a beginning; the original fluidity of the planet is the chief. Under some form or other it is expressed or implied in every system of cosmogony and even of geology, from Moses to Thales, and from Thales to Werner. This assumption originates in the same law of mind that gave rise to the *prima materia* of the Peripatetic school. In order to *comprehend* and *explain* the *forms* of things, we must imagine a state *antecedent* to form. A chaos of heterogeneous substances, such as our Milton has described, is not only an *impossible* state (for this may be equally true of every other attempt), but it is *palpably* impossible. It presupposes, moreover, the thing it is intended to solve; and makes *that* an *effect* which had been called in as the explanatory *cause*. The requisite and only serviceable fiction, therefore, is the representation of CHAOS as one

vast homogeneous drop! In this sense it may be even justified, as an appropriate symbol of the great fundamental truth that all things spring from, and subsist in, the endless strife between indifference and difference. The whole history of Nature is comprised in the specification of the transitional states from the one to the other. The symbol only is fictitious: the thing signified is not only grounded in truth—it is the law and actuating principle of all other truths, whether physical or intellectual.

Now, by magnetism in its widest sense, I mean the first and simplest *differential* act of Nature, as the power which works in *length*, and produces the first distinction between the indistinguishable by the generation of a *line*. Relatively, therefore, to fluidity, that is, to matter, the parts of which cannot be distinguished from each other by figure, magnetism is the power of fixity; but, relatively to itself, magnetism, like every other power in Nature, is designated by its opposite poles, and must be represented as the magnetic axis, the northern pole of which signifies rest, attraction, fixity, coherence, or hardness; the element of EARTH in the nomenclature of *observation* and the CARBONIC principle in that of *experiment;* while the southern pole, as its antithesis, represents mobility, repulsion, incoherence, and fusibility; the element of air in the nomenclature of observation (that is, of Nature as it appears to us when unquestioned by art), and azote or nitrogen in the nomenclature of experiment (that is, of Nature in the state so beautifully allegorized in the Homeric fable of Proteus bound down, and forced to answer by Ulysses, after having been pursued through all

his metamorphoses into his ultimate form.[1]) That nothing real does or can exist corresponding to either pole *exclusively*, is involved in the very definition of a THING as the synthesis of opposing energies. That a thing *is*, is owing to the co-inherence therein of any two powers; but that it is *that* particular thing arises from the proportions in which these powers are co-present, either as predominance or as reciprocal neutralization; but under the modification of twofold power to which magnetism itself is, as the thesis to its antithesis.

The correspondent, in the world of the senses, to the magnetic axis, exists in the series of metals. The metalleity, as the universal base of the planet, is a necessary deduction from the principles of the system. From the infusible, though evaporable, diamond to nitrogen itself, the metallic nature of which has been long suspected by chemists, though still under the mistaken notion of an oxyde, we trace a series of metals from the maximum of coherence to positive fluidity, in all ordinary temperatures, we mean. Though, in point of fact, cold itself is but a superinduction of the one pole, or, what amounts to the same thing, the subtraction of the other, under the modifications afore described; and therefore are the metals indecomposible, because they are themselves the decompositions of the metallic axis, in all its degrees of longitude and latitude. Thus the substance of the planet from which it *is*, is metallic; while that which is ever *becoming*, is in

[1] Such is the interpretation given by Lord Bacon. To which of the two gigantic intellects, the poet's or philosophic commentator's, the allegory belongs, I shall not presume to decide. Its extraordinary beauty and appropriateness remains the same in either case.

like manner produced through the perpetual modification of the first by the opposite forces of the second; that is, by the principle of contraction and difference at the eastern extreme—the element of fire, or the oxygen of the chemists; and by the elementary power of dilatation, or universality at its western extreme—the ὑδωρ ἐν ὑδατι of the ancients, and the hydrogen of the laboratory.

It has been before noticed that the progress of Nature is more truly represented by the ladder, than by the suspended chain, and that she expands as by concentric circles. This is, indeed, involved in the very conception of individuation, whether it be applied to the different species or to the individuals. In what manner the evident interspace is reconciled with the equally evident continuity of the life of Nature, is a problem that can be solved by those minds alone, which have intuitively learnt that the whole *actual* life of Nature originates in the existence, and consists in the perpetual reconciliation, and as perpetual resurgency of the primary contradiction, of which universal polarity is the result and the exponent. From the first moment of the differential impulse—(the primæval chemical epoch of the Wernerian school)—when Nature, by the tranquil deposition of crystals, prepared, as it were, the fulcrum of her after-efforts, from this, her first, and in part *irrevocable*, self-contraction, we find, in each ensuing production, more and more tendency to independent existence in the increasing multitude of strata, and in the relics of the lowest orders, first of vegetable and then of animal life. In the schistous formations, which we must here assume as in great measure the residua of vegetable creations, that have sunk back into the universal life, and in

the later predominant calcareous masses, which are the *caput mortuum* of animalized existence, we ascend from the laws of attraction and repulsion, as united in gravity, to magnetism, electricity, and constructive power, till we arrive at the point representative of a new and far higher intensity. For from this point flow, as in opposite directions, the two streams of vegetation and animalization, the former characterised by the predominance of magnetism in its highest power, as reproduction, the other by electricity intensified—as irritability, in like manner. The vegetable and animal world are the thesis and antithesis, or the opposite poles of organic life. We are not, therefore, to seek in either for analogies to the other, but for counterpoints. On the same account, the nearer the common source, the greater the likeness; the farther the remove, the greater the opposition. At the extreme limits of inorganic Nature, we may detect a dim and obscure prophecy of her ensuing process in the twigs and rude semblances that occur in crystallization of some of the copper ores, and in the well-known *arbor Dianæ*, and *arbor Veneris*. These latter Ritter has already ably explained by considering the oblique branches and their acute angles as the result of magnetic repulsion, from the presentation of the same poles, &c. In the CORALS and CONCHYLIA, the whole act and purpose of their existence seems to be that of connecting the animal with the inorganic world by the perpetual formation of calcareous earth. For the corals are nothing but polypi, which are characterised by still passing away and dissolving into the earth, which they had previously excreted, as if they were the first feeble effort of detachment. The power seems to

step forward from out the inorganic world only to fall back again upon it, still, however, under a new form, and under the predominance of the more active pole of magnetism. The product must have the same connexion, therefore, with azote, which the first rudiments of vegetation have with carbon: the one and the other exist not for their own sakes, but in order to produce the conditions best fitted for the production of higher forms. In the polypi, corallines, &c., individuality is in its first dawn; there is the same shape in them all, and a multitude of animals form, as it were, a common animal. And as the individuals run into each other, so do the different genera. They likewise pass into each other so indistinguishably, that the whole order forms a very network.

As the corals approach the conchylia, this interramification decreases. The tubipora forms the transition to the serpula; for the characteristic of all zoophytes, namely, the star shape of their openings, here disappears, and the tubiporæ are distinguished from the rest of the corals by this very circumstance, that the hollow calcareous pipes are placed side by side, without interbranching. In the serpula they have already become separate. How feeble this attempt is to individuate, is most clearly shown in their mode of generation. Notwithstanding the report of Professor Pallas, it still remains doubtful whether there exists any actual copulation among the polypi. The mere existence of a polypus suffices for its endless multiplication. They may be indefinitely propagated by cuttings, so languid is the power of individuation, so boundless that of reproduction. But the delicate jelly dissolves, as lightly as it was formed, into its own product,

and it is probable that the Polynesia, as a future continent, will be the gigantic monument, not so much of their life, as of the life of Nature in them. Here we may observe the first instance of that general law, according to which Nature still assimilates her extreme points. In these, her first and feeblest attempts to animalize organization, it is latent, because undeveloped, and merely potential; while, in the human brain, the last and most consummate of her combined energies, it is again lost or disguised in the subtlety[1] and multiplicity of its evolution.

In the class immediately above (Mollusca) we find the individuals separate, a more determinate form, and in the higher species, the rudiment of nerves, as the first scarce distinguishable impress and exponent of sensibility; still, however, the vegetative reproduction is the predominant form; and even the nerves "which float in the same cavity with the other viscera," are probably subservient to it, and extend their power in the increased intensity of the reproductive force. Still prevails the transitional state from the fluid to the solid; and the jelly, that rudiment in which all animals, even the noblest, have their commencement; constitutes the whole sphere of these rudimental animals.

In the snail and muscle, the residuum of the coral reappears, but refined and ennobled into a part of the animal. The whole class is characterised by the separation of the fluid from the solid. On the one side, a gelatinous semi-fluid; on the other side, an entirely inorganic, though often a most exquisitely mechanised, calcareous excretion!

[1] The Anatomical Demonstrations of the Brain, by Dr. Spurzheim, which I have seen, presented to me the most satisfactory proof of this.

Animalization in general is, we know, contra-distinguished from vegetables in general by the predominance of azote in the chemical composition, and of irritability in the organic process. But in this and the foregoing classes, as being still near the common equator, or the punctum indifferentiæ, the carbonic principle still asserts its claims, and the force of reproduction struggles with that of irritability. In the unreconciled strife of these two forces consists the character of the *Vermes*, which appear to be the preparatory step for the next class. Hence the difficulties which have embarrassed the naturalists, who adopt the Linnæan classification, in their endeavours to discover determinate characters of distinction between the vermes and the insecta.

But no sooner have we passed the borders, than endless variety of form and the bold display of instincts announce, that Nature has succeeded. She has created the intermediate link between the vegetable world, as the product of the reproductive or magnetic power, and the animal as the exponent of sensibility. Those that live and are nourished, on the bodies of other animals, are comparatively few, with little diversity of shape, and almost all of the same natural family. These we may pass by as exceptions. But the insect world, taken at large, appears as an intenser life, that has struggled itself loose and become emancipated from vegetation, *Floræ liberti, et libertini!* If for the sake of a moment's relaxation we might indulge a Darwinian flight, though at the risk of provoking a smile, (not, I hope, a frown) from sober judgment, we might imagine the life of insects an apotheosis of the petals, stamina, and nectaries, round which

they flutter, or of the stems and pedicles, to which they adhere. Beyond and above this step, Nature seems to act with a sort of free agency, and to have formed the classes from choice and bounty. Had she proceeded no further, yet the whole vegetable, together with the whole insect creation, would have formed within themselves an entire and independent system of Life. All plants have insects, most commonly each genus of vegetables its appropriate genera of insects; and so reciprocally interdependent and necessary to each other are they, that we can almost as little think of vegetation without insects, as of insects without vegetation. Though probably the mere likeness of *shape*, in the *papilio*, and the papilionaceous plants, suggested the idea of the former, as the latter in a state of detachment, to our late poetical and theoretical brother; yet a something, that approaches to a graver plausibility, is given to this fancy of a flying blossom; when we reflect how many plants depend upon insects for their fructification. Be it remembered, too, that with few and very obscure exceptions, the irritable power and an analogon of voluntary motion first dawn on us in the vegetable world, in the stamina, and anthers, at the period of impregnation. Then, as if Nature had been encouraged by the success of the first experiment, both the one and the other appear as predominance and general character. THE INSECT WORLD IS THE EXPONENT OF IRRITABILITY, AS THE VEGETABLE IS OF REPRODUCTION.

With the ascent in power, the intensity of individuation keeps even pace; and from this we may explain all the characteristic distinctions between this class and that of the vermes. The almost homogeneous jelly of the ani-

malcula infusoria became, by a vital oxydation, granular in the polypi. This granulation formed itself into distinct organs in the molluscæ; while for the snails, which are the next step, the animalized lime, that seemed the sole final cause of the life of the polypi, assumes all the characters of an ulterior purpose. Refined into a horn-like substance, it becomes to the snails the substitute of an organ, and their outward skeleton. Yet how much more manifold and definite, the organization of an insect, than that of the preceding class, the patient researches of Swammerdam and Lyonnet have evinced, to the delight and admiration of every reflecting mind.

In the insect, for the first time, we find the distinct commencement of a separation between the exponents of sensibility and those of irritability; i. e. between the *nervous* and the *muscular* system. The latter, however, asserts its pre-eminence throughout. The prodigal provision of organs for the purposes of respiration, and the marvellous powers which numerous tribes of insects possess, of accommodating the most corrupted airs, for a longer or shorter period, to the support of their excitability, would of itself lead us to presume, that here the *vis irritabilis* is the reigning dynasty. There is here no confluence of nerves into one reservoir, as evidence of the independent existence of sensibility *as* sensibility;—and therefore no counterpoise of a vascular system, as a distinct exponent of the irritable pole. The whole muscularity of these animals, is the organ of irritability; and the nerves themselves are probably feeders of the motory power. The petty rills of sensibility flow into the full expanse of irritability, and there lose themselves. The nerves apper-

taining to the senses, on the other hand, are indistinct, and comparatively unimportant. The multitude of immovable eyes appear not so much conductors of light, as its ultimate recipient. We are almost tempted to believe that they constitute, rather than subserve, their sensorium.

These eye-facets form the sense of light, rather than organs of seeing. Their almost paradoxical number at least, and the singularity of their forms, render it probable that they impel the animal by some modification of its irritability, herein likewise containing a striking analogy to the known influence of light on plants, than as excitements of sensibility. The sense that is nearest akin to irritability, and which alone resides in the muscular system, is that of touch, or feeling. This, therefore, is the first sense that emerges. Being confined to absolute contact, it occupies the lowest rank; but for that very reason it is the ground of all the other senses, which act, according to the ratio of their ascent, at still increasing distances, and become more and more ideal, from the tentacles of the polypus, to the human eye; which latter might be defined the outward organ of the identity, or at least of the indifference, of the real and ideal. But as the calcareous residuum of the lowest class approaches to the nature of horn in the snail, so the cumbrous shell of the snail has been transformed into polished and moveable plates of defensive armour in the insect. Thus, too, the same power of progressive individuation articulates the tentacula of the polypus and holothuria into antennæ; thereby manifesting the full emersion and eminency of irritability as a power which acts in, and gives its own character to, that of reproduction. The least observant must have noticed

the lightning-like rapidity with which the insect tribes devour and eliminate their food, as by an instinctive necessity, and in the least degree for the purposes of the animal's own growth or enlargement. The same predominance of irritability, and at the same time a new start in individuation, is shown in the reproductive power as generation. There is now a regular projection, *ab intra ad extra*, for which neither sprouts nor cuttings can any longer be the substitutes. We have not space for further detail; but there is one point too strikingly illustrative and even confirmative of the proposed system, to be omitted altogether. We mean the curious fact, that the same characteristic tendency, *ad extra*, which in the males and females of certain insect tribes is realized in the functions of generation, conception, and parturiency, manifests and expands itself in the *sexless* individuals (which are always in this case the great majority of the species), as instincts of art, and in the construction of works completely detached and inorganic; while the geometric regularity of these works, which bears an analogy to crystallization, is demonstrably no more than the necessary result of uniform action in a compressed multitude.

Again, as the insect world, averaging the whole, comes nearest to plants, (whose very essence is reproduction,) in the multitude of their germs; so does it resemble plants in the sufficiency of a single impregnation for the evolution of myriads of detached lives. Even so, the metamorphoses of insects, from the egg to the maggot and caterpillar, and from these, through the nympha and aurelia into the perfect insect, are but a more individuated and intenser form of a similar transformation of the plant

from the seed-leaflets, or cotyledons, through the stalk, the leaves, and the calyx, into the perfect flower, the various colours of which seem made for the reflection of light, as the antecedent grade to the burnished scales, and scale-like eyes of the insect. Nevertheless, with all this seeming prodigality of organic power, the whole tendency is *ad extra,* and the life of insects, as electricity in the quadrate, acts chiefly on the superficies of their bodies, to which we may add the negative proof arising from the absence of sensibility. It is well known, that the two halves of a divided insect have continued to perform, or attempt, each their separate functions, the trunkless head feeding with its accustomed voracity, while the headless trunk has exhibited its appropriate excitability to the sexual influence.

The intropulsive force, that sends the ossification inward as to the centre, is reserved for a yet higher step, and this we find embodied in the class of *fishes.* Even here, however, the process still seems imperfect, and (as it were) initiatory. The skeleton has left the surface, indeed, but the bones approach to the nature of gristle. To feel the truth of this, we need only compare the most perfect bone of a fish with the thigh-bones of the mammalia, and the distinctness with which the latter manifest the co-presence of the *magnetic* power in its solid parietes, of the *electrical* in its branching arteries, and of the third greatest power, viz., the *qualitative* and interior, in its marrow. The senses of fish are more distinct than those of insects. Thus, the intensity of its sense of smell has been placed beyond doubt, and rises in the extent of its sphere far beyond the irritable sense, or the

feeling, in insects. I say the *feeling*, not the touch; for the touch seems, as it were, a supervention to the feeling, a perfection *given* to it by the reaction of the higher powers. As the feeling of the insect, in subtlety and virtual distance, rises above the solitary sense of taste[1] in the mollusca, so does the smell of the fish rise above the feeling of the insect. In the fish, likewise, the eyes are single and moveable, while it is remarkable that the only insect that possesses this latter privilege, is an inhabitant of the waters. Finally, here first, unequivocally, and on a *large* scale, (for I pretend not to control the freedom, in which the necessity of Nature is rooted, by the precise limits of a system,)—here first, Nature exhibits, in the power of sensibility, the consummation of those vital forms (the *nisus formativi*) the adequate and the sole measure of which is to be sought for in their several organic products. But as if a weakness of exhaustion had attended this advance in the same moment it was made, Nature seems necessitated to fall back, and re-exert herself on the lower ground which she had before occupied, that of the vital magnetism, or the power of reproduction. The intensity of this latter power in the fishes, is shown both in their voracity and in the number of their eggs, which we are obliged to calculate by *weight*, not by *tale*. There is an equal intensity both of the *immanent* and the *projective* reproduction, in which, if we take in the comparative number of individuals in each species, and likewise

[1] The remark on the feeling of the antennæ, compared with the touch of man, or even of the half-reasoning elephant, is yet more applicable to the taste, which in these gelatinous animals might, perhaps not inappropriately, be entitled the gastric sense.

the different intervals between the acts, the fish (it is probable) would be found to stand in a similar relation to the insect, as the insect, in the latter point, stands to the system of vegetation. Meantime, the fish sinks a step below the insect, in the mode and circumstances of impregnation. To this we will venture to add, the predominance of *length*, as the *form* of growth in so large a proportion of the known orders of fishes, and not less of their rectilineal path of motion. In all other respects, the correspondence combined with the progress in individuation, is striking in the whole detail. Thus the eye, in addition to its moveability, has besides acquired a saline moisture in its higher development, as accordant with the life of its element. Add to these the glittering covering in both, the splendour of the scales in the one answering to the brilliant plates in the other,—the luminous reservoirs of the fire-flies,—the phosphorescence and electricity of many fishes,—the same analoga of moral qualities, in their rapacity, boldness, modes of seizing their prey by surprise,—their gills, as presenting the intermediate state between the spiracula of the grade next below, and the lungs of the step next above, both extremes of which seem combined in the structure of birds and of their quill-feathers; but above all, the convexity of the crystalline lens, so much greater than in birds, quadrupeds, and man, and seeming to collect, in one powerful organ, the hundred-fold microscopic facettes of the insect's *light* organs; and it will not be easy to resist the conviction, that the same power is at work in both, and reappears under higher auspices. The intention of Nature is repeated; but, as was to have been expected, with two main differences.

First, that in the lower grade the reproductions themselves seem merged in those of irritability, from the very circumstance that the latter constitutes no pole, either to the former, or to sensibility. The force of irritability acts, therefore, in the insect world, in full predominance; while the emergence of sensibility in the fish calls forth the opposite pole of reproduction, as a *distinct* power, and causes therefore the irritability to flow, in part, into the power of reproduction. The second result of this ascent is the direction of the organizing power, *ad intra*, with the consequent greater simplicity of the exterior form, and the substitution of condensed and flexible force, with comparative unity of implements, for that variety of tools, almost as numerous as the several objects to which they are to be applied, which arises from, and characterises, the superficial life of the insect creation. This grade of ascension, however, like the former, is accompanied by an apparent retrograde movement. For from this very accession of vital intensity we must account for the absence in the fishes of all the formative, or rather (if our language will permit it) *fabricative* instincts. How could it be otherwise? These instincts are the surplus and projection of the organizing power in the direction *ad extra*, and could not, therefore, have been expected in the class of animals that represent the first intuitive effort of organization, and are themselves the product of its first movement in the direction *ad intra*. But Nature never loses what she has once learnt, though in the acquirement of each new power she intermits, or performs less energetically, the act immediately preceding. She often drops a faculty, but never fails to pick it up again. She may seem forgetful and

absent, but it is only to recollect herself with *additional*, as well as *recruited* vigour, in some after and higher state; as if the sleep of powers, as well as of bodies, were the season and condition of their growth. Accordingly, we find these instincts again, and with them a wonderful synthesis of fish and insect, as a higher third, in the feathered inhabitants of the air. Nay, she seems to have gone yet further back, and having given B + C = D in the birds, so to have sported with one solitary instance of B + D = A in that curious animal the dragon, the anatomy of which has been recently given to the public by Tiedemann; from whose work it appears, that this creature presents itself to us with the wings of the insect, and with the nervous system, the brain, and the cranium of the bird, in their several rudiments.

The synthesis of fish and insect in the birds, might be illustrated equally in detail with the former; but it will be sufficient for our purpose, that as in both the former cases, the insect and the fish, so here in that of the birds, the powers are under the predominance of irritability; the sensibility being dormant in the first, awakening in the second, and awake, but still subordinate, in the third. Of this my limits confine me to a single presumptive proof, viz., the superiority in strength and courage of the female in the birds of prey. For herein, indeed, does the difference of the sexes universally consist, wherever both the forces are developed, that the female is characterised by quicker irritability, and the male by deeper sensibility. How large a stride has been now made by Nature in the progress of individuation, what ornithologist does not know? From a multitude of instances we select the most

impressive, the power of sound, with the first rudiments of modulation! That all languages designate the melody of birds as singing (though according to Blumenbach man only sings, while birds do but whistle), demonstrates that it has been felt as, what indeed it is, a tentative and prophetic prelude of something yet to come. With this conjoin the power and the tendency to acquire articulation, and to imitate speech; conjoin the building instinct and the migratory, the monogamy of several species, and the pairing of almost all; and we shall have collected new instances of the usage (I dare not say law) according to which Nature lets fall, in order to resume, and steps backward the furthest, when she means to leap forwards with the greatest concentration of energy.

For lo! in the next step of ascent the power of sensibility has assumed her due place and rank: her minority is at an end, and the complete and universal presence of a nervous system unites absolutely, by instanteity of time what, with the due allowances for the transitional process, had before been either lost in sameness, or perplexed by multiplicity, or compacted by a finer mechanism. But with this, all the analogies with which Nature had delighted us in the preceding step seem lost, and, with the single exception of that more than valuable, that estimable philanthropist, the dog, and, perhaps, of the horse and elephant, the analogies to ourselves, which we can discover in the quadrupeds or quadrumani, are of our vices, our follies, and our imperfections. The facts in confirmation of both the propositions are so numerous and so obvious, the advance of Nature, under the predominance of the third synthetic power, both in the intensity of life and in

the intenseness and extension of individuality, is so undeniable, that we may leap forward at once to the highest realization and reconciliation of both her tendencies, that of the most perfect detachment with the greatest possible union, to that last work, in which Nature did not assist as handmaid under the eye of her sovereign Master, who made Man in his own image, by superadding self-consciousness with self-government, and breathed into him a living soul.

The class of *Vermes* deposit a calcareous stuff, as if it had torn loose from the earth a piece of the gross mass which it must still drag about with it. In the insect class this residuum has refined itself. In the fishes and amphibia it is driven back or inward, the organic power begins to be intuitive, and sensibility appears. In the birds the bones have become hollow; while, with apparent proportional recess, but, in truth, by the excitement of the opposite pole, their exterior presents an actual vegetation. The bones of the mammalia are filled up, and their coverings have become more simple. Man possesses the most perfect osseous structure, the least and most insignificant covering. The whole force of organic power has attained an inward and centripetal direction. He has the whole world in counterpoint to him, but he contains an entire world within himself. Now, for the first time at the apex of the living pyramid, it is Man and Nature, but Man himself is a syllepsis, a compendium of Nature—the Microcosm! Naked and helpless cometh man into the world. Such has been the complaint from eldest time; but we complain of our chief privilege, our ornament, and the connate mark of our sovereignty. *Porphyrigeniti*

sumus! In Man the centripetal and individualizing tendency of all Nature is itself concentred and individualized —he is a revelation of Nature! Henceforward, he is referred to himself, delivered up to his own charge; and he who stands the most on himself, and stands the firmest, is the truest, because the most individual, Man. In social and political life this acme is inter-dependence; in moral life it is independence; in intellectual life it is genius. Nor does the form of polarity, which has accompanied the law of individuation up its whole ascent, desert it here. As the height, so the depth. The intensities must be at once opposite and equal. As the liberty, so must be the reverence for law. As the independence, so must be the service and the submission to the Supreme Will! As the ideal genius and the originality, in the same proportion must be the resignation to the real world, the sympathy and the inter-communion with Nature. In the conciliating mid-point, or equator, does the Man live, and only by its equal presence in both its poles can that life be manifested!

If it had been possible, within the prescribed limits of this essay, to have deduced the philosophy of Life synthetically, the evidence would have been carried over from section to section, and the *quod erat demonstrandum* at the conclusion of one section would reappear as the principle of the succeeding—the goal of the one would be the starting-post of the other. Positions arranged in my own mind, as intermediate and organic links of administration, must be presented to the reader in the first instance, at least, as a mere hypothesis. Instead of

demanding his assent as a right, I must solicit a suspension of his judgment as a courtesy; and, after all, however firmly the hypothesis may support the phenomena piled upon it, we can deduce no more than a practical rule, grounded on a strong presumption. The license of arithmetic, however, furnishes instances that a rule may be usefully applied in practice, and for the particular purpose may be sufficiently authenticated by the result, before it has itself been duly demonstrated. It is enough, if only it hath been rendered fully intelligible.

In a system where every position proceeds from a scientific preconstruction, a power acting exclusively in length, would be magnetism by virtue of our own definition of the term. In like manner, a surface power would be electricity, as far as that system was concerned, whether it accorded or not with the facts ordinarily so called. But it is incumbent on us, who must treat the subject *analytically*, to show by experiment that magnetism does in fact act longitudinally, and electricity superficially; and that, consequently, the former is distinguished from, and yet contained in, the latter, as a straight line is distinguished from, yet contained in, a superficies.

First, that magnetism, in its conductors, seeks and follows length only, and by the length is itself conducted, has been proved by Brugmans, in his philosophical Essay on the Matter of Magnetism, where he relates that a magnet capable of supporting a body four times heavier than itself, and which acted as a magnetic needle at the distance of twenty inches, was so weakened by the interposition of three cast-iron plates of considerable thickness, as scarcely to move the magnetic needle from its place at

a distance of only three inches. A similar experiment had been made by Descartes. I concluded, therefore, said Brugmans, that if the iron plates were interposed between the magnet and the needle lengthways, instead of breadthways or right across, the action of the magnet on the magnetic needle would, in consequence of this great increase of resistance, become still weaker, or perhaps evanescent. But not less to my surprise than my admiration, I found that the power of the magnet was so far from being *diminished* by this change in the relative position of the iron-plates; that, on the contrary, it now extended to a far greater distance than when no iron at all was interposed. Some time after the same philosopher, out of several iron bars, the sides of which were an inch broad each, composed a single bar of the length of more than ten feet, and observed the magnetism make its way through the whole mass. But, in order to try whether the action could be propagated to any length indefinitely, after several experiments with bars of intermediate lengths, in all of which he had succeeded, he tried a four-cornered iron rod, more than twenty feet long, and it was at this length that the magnetic power first began to be diminished. So far Brugmans.

But the shortest way for any one to convince himself of this relation of the magnetic power would be, in one and the same experiment, to interpose the same piece of iron between the magnet and the compass needle first *breadthways*; and in this case it will be found that the needle, which had been previously deflected by the magnet from its natural position at one of its poles, will instantly resume the same, either wholly or very nearly so—then to

interpose the same piece of iron *lengthways*; in which case the position of the compass needle will be scarcely or not at all affected.

The assertion of Bernoulli and others, that the absolute force of the artificial magnet increases in the ratio of its superficies, stands corrected in the far more accurate experiments of Coulomb (published in his Treatise on Magnetism), which proves that the increase takes place (in a far greater degree) in the ratio of its length. The same naturalist even found means to determine that the directing powers of the needle, which he had measured by help of his *balance de tortion*, stand to the length of the needle in such a ratio as that, provided only the length of the needle is from forty to fifty times its diameter, the momenta of these directing powers will increase in the very same direct proportion as the length is increased. Nor is this all that may be deduced from the experiment last mentioned. If only the magnet be strong enough, it will show likewise that magnetism *seeks* the length. The proof is contained in the remarkable fact, that the iron interposed between the magnet and the magnetic needle *breadthways* constantly acquires its two opposite poles at both ends *lengthways*. Though the preceding experiments are abundantly sufficient to prove the position, yet the following deserves mention for the beautiful clearness of its evidence. If the magnetic power is determined exclusively by length, it is to be expected that it will manifest no force, where the piece of iron is of such a shape that no one dimension predominates. Bring a *cube* of iron near the magnetic needle and it will not exert the slightest degree of power beyond what belongs to it

as mere iron. By the perfect equality of the dimensions, the magnetism of the earth appears, as it were, perplexed and doubtful. Now, then attach a second cube of iron to the first, and the instantaneous act of the iron on the magnetic needle will make it manifest that with the length thus given, the magnetic influence is given at the same moment.

That electricity, on the other hand, does not act in length merely, is clear, from the fact that every electric body is electric over its whole surface. But that electricity acts both in length and breadth, and *only* in length and breadth, and not in depth; in short, that the (so-called) electrical fluid in an electrified body spreads over the whole surface of that body without penetrating it, or tending *ad intra*, may be proved by direct experiment. Take a cylinder of wood, and bore an indefinite number of holes in it, each of them four lines in depth and four in diameter. Electrify this cylinder, and present to its superficies a small square of gold-leaf, held to it by an insulating needle of gum lac, and bring this square to an electrometer of great sensibility. The electrometer will instantly show an electricity in the gold-leaf, similar to that of the cylinder which had been brought into contact with it. The square of gold-leaf having thus been discharged of its electricity, put it carefully into one of the holes of the cylinder, *so*, namely, that it shall touch only the bottom of the hole, and present it again to the electrometer. It will be then found that the electrometer will exhibit no signs of electricity whatsoever. From this it follows, that the electricity which had been communicated to the cylinder had confined itself to the *surface*.

If the time and the limit prescribed would admit, we could multiply experiments, all tending to prove the same law; but we must be content with the barely sufficient. But that the *chemical process* acts in *depth*, and first, therefore, *realizes* and integrates the fluxional power of magnetism and electricity, is involved in the *term* composition; and this will become still more convincing when we have learnt to regard *decomposition* as a mere co-relative, i. e. as decomposition relatively to the body decomposed, but composition *actually* and in respect of the substances, *into* which it was decomposed. The alteration in the specific gravity of metals in their chemical amalgams, interesting as the fact is in all points, is *decisive* in the present; for gravity is the sole *inward* of inorganic bodies—it *constitutes* their depth.

I can now, for the first time, give to my opinions that degree of intelligibility, which is requisite for their introduction as hypotheses; the experiments above related, understood as in the common mode of thinking, prove that the magnetic influence flows in length, the electric fluid by suffusion, and that chemical agency (whatever the main agent may be) is qualitative and *in intimis*. Now my hypothesis demands the converse of all this. I affirm that a power, acting exclusively in length, is (wherever it be found) *magnetism*; that a power which acts *both* in length and in breadth, and *only* in length and breadth, is (wherever it be found) *electricity;* and finally, that a power which, together with length and breadth, includes depth likewise, is (wherever it be found) *constructive agency*. That is but *one* phenomenon of magnetism, to which we have appropriated and confined the

term magnetism; because of all the natural bodies at present known, iron, and one or two of its nearest relatives in the family of hard yet coherent metals, are the only ones, in which all the conditions are collected, under which alone the magnetic agency can appear in and during the act itself. When, therefore, I affirm the power of reproduction in organized bodies to be magnetism, I must be understood to mean that this power, as it exists in the magnet, and which we there (to use a strong phrase) catch in the very act, is to the same kind of power, working as reproductive, what the root is to the cube of that root. We no more confound the force in the compass needle with that of reproduction, than a man can be said to confound his liver with a lichen, because he affirms that both of them grow.

The same precautions are to be repeated in the identification of electricity with irritability; and the power of depth, for which we have yet no appropriated term, with sensibility. How great the distance is in all, and that the lowest degrees are adopted as the exponent terms, not for their own sakes, but merely because they may be used with less hazard of diverting the attention from the *kind* by peculiar properties arising out of the degree, is evident from the third instance, unless the theorist can be supposed insane enough to apply sensation in good earnest to the effervescence of an acid or an alkali, or to sympathise with the distresses of a vat of new beer when it is working. In whatever way the subject could be treated, it must have remained unintelligible to men who, if they think of space at all, abstract their notion of it from the contents of an exhausted receiver. With this, and with an ether, such

men may work wonders; as what, indeed, cannot be done with a plenum and a vacuum, when a theorist has privileged himself to assume the one, or the other, *ad libitum?*—in all innocence of heart, and undisturbed by the reflection that the two things cannot both be true. That both time and space are mere abstractions I am well aware; but I know with equal certainty that what is *expressed* by them as the *identity* of both is the highest reality, and the root of all power, the power to suffer, as well as the power to act. However mere an *ens logicum* space may be, the *dimensions* of space are real, and the works of Galileo, in more than one elegant passage, prove with what awe and amazement they fill the mind that worthily contemplates them. Dismissing, therefore, all facts of degrees, as introduced merely for the purposes of illustration, I would make as little reference as possible to the magnet, the charged phial, or the processes of the laboratory, and designate the three powers in the process of our animal life, each by two co-relative terms, the one expressing the *form*, and the other the *object* and *product* of the power. My hypothesis will, therefore, be thus expressed, that the constituent forces of life in the human living body are—first, the power of length, or REPRODUCTION; second, the power of surface (that is, length and breadth), or IRRITABILITY; third, the power of depth, or SENSIBILITY. With this observation I may conclude these remarks, only reminding the reader that Life itself is neither of these separately, but the copula of all three—that Life, *as* Life, supposes a positive or universal principle in Nature, with a negative principle in every particular animal, the latter, or limitative power, constantly acting to indivi-

dualize, and, as it were, *figure* the former. *Thus,* then, Life itself is not a *thing*—a self-subsistent *hypostasis*—but an *act* and *process;* which, pitiable as the prejudice will appear to the *forts esprits,* is a great deal more than either my reason would authorise or my conscience allow me to assert—concerning the Soul, as the principle both of Reason and Conscience.

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POSTSCRIPT.

THE Editor deems it right to state that the contents of the foregoing pages were, amongst other Papers, placed at his disposal by an intimate friend of the late S. T. COLERIDGE; and from internal evidence he was induced to attribute to that gentleman the entire authorship. After, however, the present edition had passed through the press, and was on the eve of publication, circumstances arose which led to the belief that the work might with more propriety be considered as the joint production of Mr. COLERIDGE and the late Mr. JAMES GILLMAN, of Highgate.

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